PUBLIC LIBRARY
AUG 9 - 1946
DETROIT

NATIONAL PETROLEUM NEWS

August 7, 1946
Vol. 38—No. 32

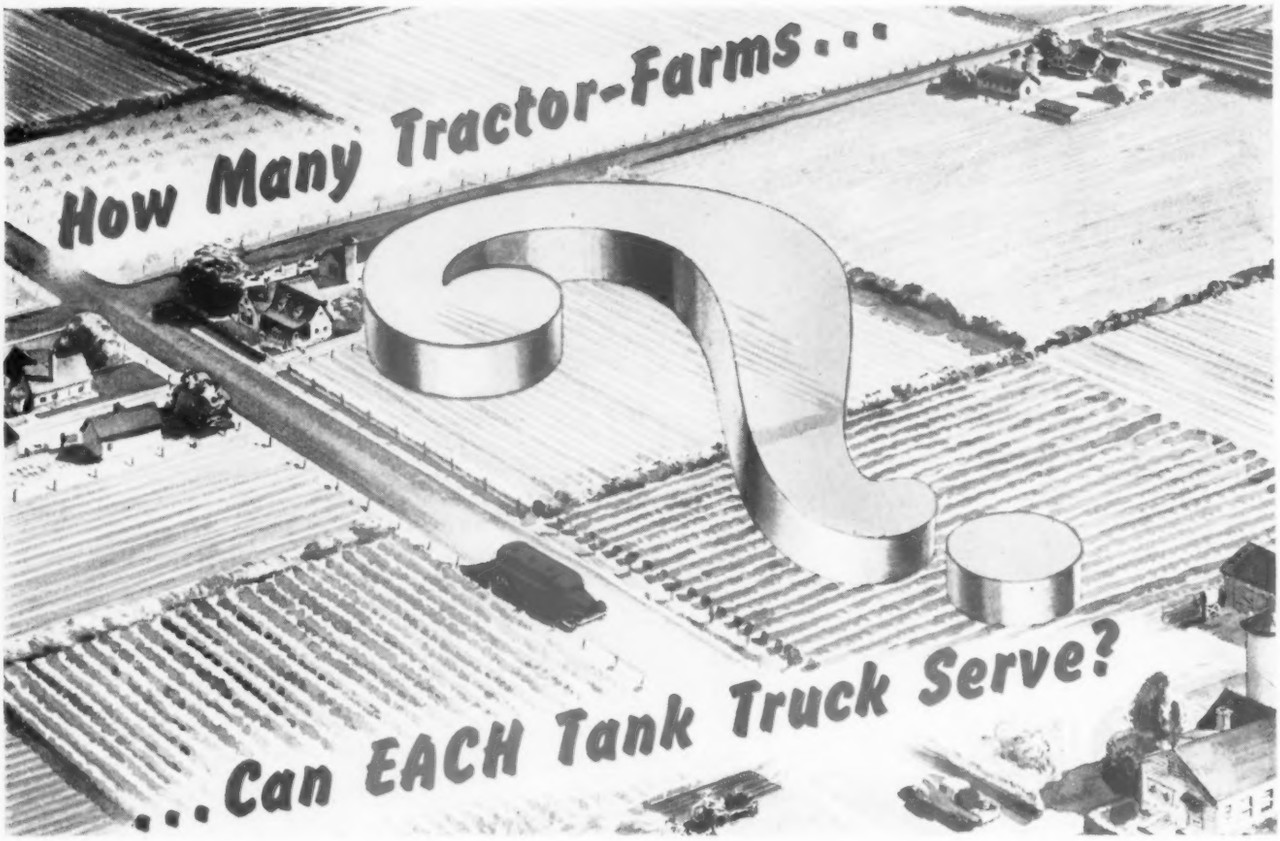
TECHNOLOGY DEPT.

REFINERY WORKERS HIGHEST PAID OF 25 MAJOR U. S. INDUSTRIES

The above chart, prepared by the American Petroleum Institute from October, 1945, figures published by the National Industrial Conference Board, emphasizes the extent to which petroleum refining tops other major industries in wage rates.

PREPARING FOR ANY EVENTUALITY

World War II brought with it tremendous problems of petroleum supply at the front. Solution of these problems often was delayed because of the military's inefficient utilization of oil men in uniform and the talents they had to offer. To avoid repetition of a similar situation, should there be another war, and to prepare the oil industry and the military to cope with any future war oil supply problems, Carl E. Cummings, an ex-colonel with POL and now with The Texas Co., has been named head of a committee to organize an oil industry reserve corps. Objectives of this corps and its organization program are told in a story on p. 28.



WITH FARM ROUTES established on the basis of the number of tractors to be served, handling time is the principal factor on which sales coverage and daily gallonage volume are determined. Equipped with Brodie Quantrol Meters, each rural delivery truck can serve many times the number of *tractor-farms* than could be served by the slow man-killing method of hand bucketing. The fully automatic delivery control of Brodie Quantrol Meters enables one tank wagon salesman to make fast accurate transfers to elevated storage tanks, drums in oil sheds, and other inaccessible or out-of-the-way places where long hose discharge is required. All the salesman has to do is pre-set the desired number of gallons to be delivered—and then open the valve. When the exact gallonage has passed through the meter, it shuts off automatically. To obtain maximum coverage of the farm market, equip your tank trucks with Brodie Quantrol Meters. Get full details today.

RALPH N. BRODIE CO., Inc.
950 61st Street, Oakland 8, California, U.S.A.
Division Offices: CHRYSLER BLDG., NEW YORK CITY • 59 E. VAN BUREN, CHICAGO 5 • 302 SOUTH PEARL STREET, DALLAS 1, TEXAS • 164 JACKSON, SEATTLE 4, WASH. • 2101 SOUTH SAN PEDRO, LOS ANGELES 11, CALIF.

REPRESENTATIVES AND STOCKS IN ALL PRINCIPAL CITIES

BRODIE METER EQUIPPED WITH BRODIMATIC QUANTROL... For Fully Automatic Quantity Control

BRODIE METERS

PETROLEUM METERING EXCLUSIVELY

SINCE 1927

Proven DEPENDABILITY

Large oil and chemical companies have used ViseGrip closures for twenty-five years.

Many have adapted them exclusively after comparative tests. Vise-Grip is the seal of extra strength and dependable performance.

ViseGrip closures really protect your products.

Leak-proof sealing . . . traffic safety . . . and full-measure delivery . . . the characteristics of VISEGRIP CLOSURES, *the all-steel closures for steel drums, are available to all users of drums in the United States. Every drum manufacturer has a stock of* VISEGRIP CLOSURES *and is equipped with the Rieke Dies that will build the closures into drums.*

SPECIFICATION:

Drums to be equipped with VISEGRIP closures

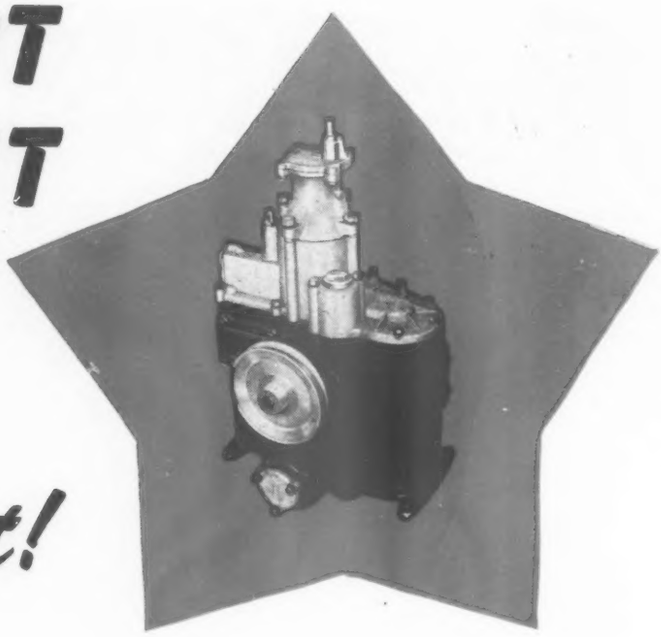
VISEGRIP CLOSURES

developed and produced for more than twenty years by

AUBURN, INDIANA **RIEKE METAL PRODUCTS CORPORATION** NEW YORK, N. Y.

The COMPACT UNIT

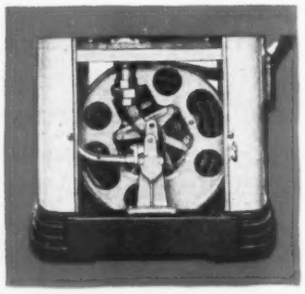
Only RED SEAL has it!



● Yes, only the Red Seal Pump has the long-life Compact Unit. It is remarkable in the simplicity of its design and construction. The dependable Red Seal Meter, pump strainers, pressure control, air separator, line check and pressure relief valve are in a single assembly. Noted for long, trouble-free life and ease of maintenance, the Compact Unit saves time and money for you.

But that isn't all Neptune provides to insure you of maximum economy over the years. You also get the benefit of an exclusive Single Unit Replacement Plan whereby, through exchange of your old Red Seal Compact Unit, motor, register, and hose reel you can eliminate expensive servicing and repairing in the field—get pumps back in service faster, save money.

Find out all about the many established advantages of Red Seal Pumps. Phone or write the nearest Neptune office or petroleum equipment jobber for complete details today.



Self-Winding Hose Reel Speeds Service

It's mounted in the pump base. Easy pull, quick return. Hose reels up automatically. Most of it disappears inside; the rest stays flat against the pump—out of reach of car bumpers. It helps speed service, prevent accidents. Ask for full information about the Red Seal Pump with this time-saving feature.

NEPTUNE RED SEAL PUMPS

Accuracy you can bank on

NEPTUNE METER COMPANY • 50 West 50th Street New York 20, N. Y.

Branches and Warehouses: **Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, Mo., Los Angeles, Louisville, Philadelphia, Portland, Ore., and San Francisco**

A-178

Published Every Week

Member: Audit Bureau of Circulation and Associated Business Papers, Inc.

WARREN C. PLATT, ... *Editor and Publisher*
A. E. KRAFT, ... *Treasurer*
V. B. GUTHRIE, *Associate and Technical Editor*
Y. A. KOSKINEN, ... *Advertising Manager*

NATIONAL PETROLEUM NEWS

Vol. 38—No. 32 ESTABLISHED 1909 **August 7, 1946**

THE NEWS WEEKLY OF THE OIL INDUSTRY

COMING MEETINGS

AUGUST

National Council of Independent Petroleum Assns., meeting at Hotel Severin, Indianapolis, Aug. 19-20.
Society of Automotive Engineers, West Coast Transportation & Maintenance meeting, Hotel New Washington, Seattle, Wash., Aug. 22-24.

SEPTEMBER

Michigan Petroleum Assn., fall convention, Park Place Hotel, Traverse City, Mich., Sept. 10-11.
Chicago Section, American Chemical Society, Coliseum, Chicago, Sept. 10-14.
Society of Automotive Engineers, Tractor Meeting, Hotel Schroeder, Milwaukee, Wis., Sept. 11-12.
National Petroleum Assn., 44th annual meeting, Hotel Traymore, Atlantic City, N. J., Sept. 18-20.
Chicago Oil Men's Club, fall golf party, Acacia Country Club, Joliet Rd., Chicago.
National Butane-Propane Assn., annual convention, Continental Hotel, Chicago, Sept. 23-25.
Indiana Independent Petroleum Assn., fall convention, Hotel Severin, Indianapolis, Sept. 26-27.
Rocky Mountain Oil & Gas Assn., quarterly board meeting, Northern Hotel, Billings, Mont., Sept. 27-28.
National Lubricating Grease Institute, 14th annual meeting, Edgewater Beach Hotel, Chicago, Sept. 29-Oct. 2.

OCTOBER

Empire State Petroleum Assn., Hotel Commodore, New York City, Oct. 1-3.
American Assn. of Oilwell Drilling Contractors, annual meeting, Plaza Hotel, San Antonio, Tex., Oct. 1-2.
Society of Automotive Engineers, Aeronautic (Autumn) & Aircraft Engineering Display, Hotel Biltmore, Los Angeles, Oct. 3-5.
American Institute of Mining & Metallurgical Engineers, Petroleum Division, annual meeting, Galvez Hotel, Galveston, Tex., Oct. 3-5.
National Assn. of Credit Men, Petroleum Division, fall conference, Roosevelt Hotel, Pittsburgh, Oct. 9-11.
West Virginia Petroleum Assn., meeting at Daniel Boone Hotel, Charleston, W. Va., Oct. 16.
Society of Automotive Engineers, Transportation and Maintenance Meeting, Hotel Knickerbocker, Chicago, Oct. 16-17.
Texas-Midcontinent Oil & Gas Assn., Rice Hotel, Houston, Oct. 16-18.
American Institute of Mining & Metallurgical Engineers, Petroleum Division, Ambassador Hotel, Los Angeles, Oct. 24-25.
Tennessee Oil Men's Assn., annual fall meeting, Peabody Hotel, Memphis, Tenn., Oct. 27-29.
Independent Petroleum Assn. of America, annual meeting, Fort Worth, Oct. 28-30.

NOVEMBER

South Dakota Independent Oil Men's Assn., Alex Johnson Hotel, Rapid City, S. D., Oct. 29-30.
American Petroleum Institute, annual convention, Stevens Hotel, Chicago, Nov. 11-14.
Rocky Mountain Oil & Gas Assn., annual meeting, Shirley-Savoy Hotel, Denver, Nov. 21-23.

DECEMBER

Society of Automotive Engineers, Air Transport Engineering Meeting, Edgewater Beach Hotel, Chicago, Dec. 2-4.
Nebraska Petroleum Marketers, Inc., Dec. 3-5.
Wisconsin Petroleum Assn., Schroeder Hotel, Milwaukee, Dec. 3-5.

Contents

NEWS SECTION 11

FEATURE INDEX

OIL INDUSTRY PREPAREDNESS—Organization of former POL men being formed to study military and industry changes necessary to prepare industry if there is another war 28

RESERVE CORPS ORGANIZER—A sketch of Colonel Cummings, the man given the task of bringing ex-military oil men into an industry reserve corps 29

WISCONSIN JOBBERS—Survey shows oil marketers very active in home town 32

CALIFORNIA NATURAL GASOLINE ASSN.—Holds annual meeting at Los Angeles, elects M. W. Kibre president 34

MANAGEMENT SERVICE FOR DEALERS—Task of oil marketer representative in supervision of dealers and acting as business consultant rather than a mere salesman described in story giving viewpoints of one major marketing executive 39

GASOLINE TAX RECEIPTS—1946 totals may set new record but shortages of labor, materials may hold up highway projects 44

OIL BURNER SHIPMENTS—May shipments show 6% drop. Breakdown of totals given 44

DEPARTMENTS

About Oil People 71
Advertisers' Index 71
Ahead of the News 5
Atlantic Coast Comment 7
Editorially Speaking 23
Markets 54
Midwest Comment 9
Oil Prices 55
Oil Transportation News 52
Production News 46
Refining News 50
Statistics 62
Washington Comment 7

PUBLICATION OFFICE: 1213 West 3rd Street, Cleveland 13, Ohio, CHerry 7672. **Cable Address:** "PLATTOIL, Clevelandohio". Cable inquiries are answered by mail unless sufficient funds in United States money are advanced for cabled reply.

NEWS BUREAUS

New York COlumbus 5-1695, 50 West 50th St., New York 20
Chicago HARrison 5901, 59 East Van Buren St., Chicago 5
Washington NAtional 3477, 1034 National Press Bldg., Washington 4
Tulsa 3-7132, 904 World Bldg., Tulsa 3

Subscription rate $5 per year in United States, Mexico and Pan-American Countries; $6.50 in Canada and Foreign Countries. Current copies 20 cents, except special issues; back copies more than two months old 30 cents per copy. Trade Mark Registered U. S. Patent Office.
Copyright 1946 by The National Petroleum Publishing Co.
Entered as second class matter Jan. 17, 1910 at Cleveland, O., post office under act of March 3, 1879, by the National Petroleum Publishing Co.

It repaid 3000%

Reproduction of **VENTALARM** *taken from Dr. McIntire's home*

IN 10 YEARS...

ON ONE DOMESTIC BURNER STORAGE TANK

History of this VENTALARM

In March, 1936, this VENTALARM was installed free by the Briggs Oil Company, Swampscott, Mass., on a single flat 275 gallon tank in the home of Dr. Frederic J. McIntire, 28 Puritan Park, Swampscott, Mass.

In April, 1946, this VENTALARM was removed from Dr. McIntire's home in order that it might be exhibited at the National Oil Heat Exposition at Philadelphia. The VENTALARM is in as good operating condition as on the day it was installed.

The average yearly consumption of fuel oil in Dr. McIntire's home was 3200 gallons a year. The average delivery was 175 gallons per drop (route delivery). 18 deliveries each year — 180 deliveries in the 10 year period. 180 times oil was delivered to the home without disturbing the householder in any way whatsoever.

Savings effected by this VENTALARM

180 deliveries made in 10 years
5 minutes saved at each delivery
900 total minutes saved or 15 hours

15 hours saved
3.00 hourly cost of man and truck
$45.00 DOLLAR SAVING IN 10 YEARS

$ 1.50 ORIGINAL COST OF THE VENTALARM

$45.00 / $ 1.50 = 3000 % on the investment

If you're in the fuel oil business, you can make no better investment than installing VENTALARMS on your customers' fuel oil tanks.

There is also a Scully VENTALARM designed to make the filling of gasoline tanks on cars, buses, and trucks safe — speedy — convenient — economical.

SCULLY
VENTALARM
T.M. REG. U.S. PAT. OFF.
The Whistling TANK FILL SIGNAL
SCULLY SIGNAL COMPANY
88 FIRST STREET · CAMBRIDGE 41, MASS.

Manufactured in Canada by **EMPIRE BRASS MFG. CO., LTD., London, Ontario**

AHEAD of the NEWS

WITH MEMORIES OF JOHN L.—One of the brakes upon the Oil Workers International Union is consideration of what John L. Lewis' frequent strikes have done to the coal industry. First, OWIU leaders are aware of the fact that a principal reason for the great public demand for oil and gas is apprehension about the effect of repeated coal strikes upon coal bins. They feel that John L. has turned the country away from coal and thus has jeopardized the future of coal miners. Second, OWIU officials, like other top men in the CIO, carry an intense dislike for Lewis and would not care to be in the position of following his public-be-damned attitude toward strikes that curtail fuel supply.

• • •

DIESEL DISCUSSION—In view of the prediction by Howard W. Page, Jersey Standard's economist, that use of Diesel power on the farms is due for a spectacular increase, there's more than usual oil industry interest in the Society of Automotive Engineers' coming National Tractor meeting to be held at Milwaukee Sept. 11 and 12. Page, in his API meeting speech at Denver a month ago, predicted that agricultural use of gasoline will decline about 14% between now and 1950 due to a switch on the farms to Diesel power.

• • •

REFORM—PERHAPS—Eventually some thought will be given to the possibilities in a little noted measure put through during recent session of Congress. Known as the Administrative Procedure Act, it is designed to make all rulings of government bureaus subject to review by the courts. Possible meaning of the act to the oil industry cannot be known until appeals are taken from some NLRB, Wage-Hour or other agency rulings. The wording is general, reading: "Any person suffering legal wrong because of any agency action, or adversely affected or aggrieved by such action within the meaning of any relevant statute, shall be entitled to judicial review thereof."

• • •

LOOK TO TEXAS—Industry gossip in Texas is that both Skelly and Mid-Continent will follow the lead of Phillips and invade the Texas products market as soon as pumps and other equipment are available.

• • •

NO THANK YOU—National Oil Marketers Assn. has notified API that it cannot respond one way or another until after its next meeting to API proffer of a seat on its board of directors for president of NOMA. Word is out, however, that NOMA at that meeting will reject the invite.

• • •

TAKE A LETTER—A further exchange of letters beween Oil & Gas Division and Justice Department is in the making, this time to clear up a point raised by National Petroleum Council lawyers named to establish ground rules for industry co-operation with government. Legal group is concerned over language in Attorney General Clark's letter of May 27 which, at first reading, would seem to place a limit on what NPC working committees may legally do; has asked OGD to obtain a clarifying statement from Justice.

• • •

BUILDING HOPES—There's a big "IF" involved, but CPA planners hold some hope that present sharp cutback in non-housing construction may be modified somewhat after another two or three months. Big "IF" is supply of building materials, which CPA now believes is showing signs of getting progressively better.

• • •

PATENTS PATTERN—A new directive on patent clauses in Navy contracts may be issued soon which could well set the pattern for long-term policy for the armed forces. Divergent viewpoints of the Navy and industry on provisions issued last Fall have been reconciled, at least in principle, and the service is pushing work on the new draft. When it is written, it will be submitted to the War Department for concurrence.

• • •

TIRE COMEBACK—Chances are good that restrictions on production of white sidewall tires can be lifted along about the end of the year. Optimistic view is taken by CPA Rubber Division officials, but actual decision on whether to lift ban will not be made until sometime in fourth quarter, after a review of entire tire supply situation.

• • •

FOREIGN OIL—The prospect of tankers flooding the Texas seacoast with crude from the booming fields of Venezuela is causing Texas producers some bad nights.

• • •

TEXAS POLITICS—Homer P. Rainey, who trailed Railroad Commissioner Beauford Jester in the Texas primary election for governor, has indicated he will try to hang the mantle of "the oil man's candidate" on Jester. He has already taken public notice of the 25 cent increase in the price of crude and the resulting raise in gasoline prices to the consumers, and has drawn attention to the fact that Jester favored the crude price hike. Only embarrassment is that Former Gov. James Allred, one of Rainey's advisers and avid supporters, bought time on a Texas radio hookup several months ago to urge public support of the crude price hike.

• • •

NO MORE PEAK SEASON—One large oil marketer finds rising demand for heating oil has almost brought its winter and summer tank truck deliveries up to a level volume. In its market area, individual inquiries about oil heat are flooding in, at one point averaging more than 100 telephone calls a day from territory formerly known as coal and gas stronghold. Some concern is felt over possible shortage of burner service men.

CLIMATE IN A CAGE:

Agricultural Research has always tended to be a local affair because of such variables as soil composition, growing seasons, rainfall, types of crops and pests. It is apparent that even large research budgets would be spread pretty thin over dozens of duplicating experimental tracts in different parts of the continent. If only the variables could be controlled in one big laboratory—Well, that's what Shell is doing!

Q:
Who initiates research in the oil industry?

A:
The men who use its products—for example: Farmers with problems as varied as their lands.

Chosen for soil, water, climate by a committee of leading agricultural scientists, Shell's new 142-acre experimental laboratory represents a good "sample" of North American soil and weather. But supplementing the outdoor farm will be a series of indoor "test-tube" farms with controllable temperature and humidity.

As Shell researchers wish, one room may represent a Florida orange grove, another a Canadian wheat field. Soil enrichment, eradication of crop diseases and pests, and dozens of other types of projects can go forward, summer and winter.

Such research, repeatedly solving the problems of the men who use petroleum products adds to the growing prestige of the oil industry. Shell Research works tirelessly today—to make petroleum serve mankind in more ways.

SHELL

Horizons widen through Shell Research

© 1945, SHELL OIL COMPANY, INCORPORATED

Mr. Yocom

WASHINGTON—By Herbert Yocom

'Powerful, Sinister Oil Lobby' Is Myth Promoted by Mr. Ickes

That "great, powerful and sinister oil lobby" is about to be unmasked and this corner is all a-twitter.

Because after more than a decade of watching the Washington scene apparently at long last we're going to find out just who are the members of this group which, if we are to believe Harold L. Ickes and others, can make the Congress kow tow to its every wish—just like that! (Picture of man snapping his fingers).

As we say, this "evil lobby" is about to be unmasked, but only by reason of the fact that the President has just signed the Congressional Reorganization Act.

There's a Title III to this new law which bears the label "Regulation of Lobbying Act." It provides that all who carry on lobbying activities for or against legislation must register themselves with the Clerk of the House of Representatives. There are some pretty stiff penalty provisions attached and requirement is made for the reporting of contributions, expenditures, etc.

Already we can picture the scene when the day arrives to register with the Clerk—

If what Mr. Ickes alleges is true, the file of oil lobbyists will stretch three times around the Capitol Building and then down onto the Mall and out beyond the Washington monument to the Lincoln Memorial. Furthermore, each one of these vicious rascals will be carrying a black bag and when any of them smile—or maybe scowl would be better—there will be a flashing of gold teeth. Also, each will be holding a chain or two or three and securely tied at the end of each, like dogs to a leash, will be—you guessed it—a whimpering Congressman or a Senator.

Yes, it would be quite a sight if what "Honest Harold" says should turn out to be correct—only it's not going to be that way at all.

As a matter of fact, there is no such animal as an "oil lobby" here in Washington and never in the writer's time has there been. The "oil lobby" is a myth, but one the constant re-telling of which by such as Mr. Ickes has caused to be created in the public mind the impression that there really exists in the capital such a powerful and evil force.

Mr. Ickes has his own ends to serve, of course, in iterating this charge, and that is to encourage the defeat of any and all legislation with which he personally does not happen to be in agreement, but which the oil industry legitimately might desire to see enacted. That being the case, there is perhaps more reason for the "Old Curmudgeon" registering as a lobbyist under this new law than for any of the oil men whom he is always seeking to smear with the self-same label.

Even at the risk of making this seem to be "Pick on Ickes Day," it's of more than passing interest that Interior Secretary Krug has just tossed into the ash can another of the Ickes' policies which so stirred the ire of westerners during his nearly 13-year reign as czar of the public domain.

We refer to the Ickes' policy of withdrawing federal public lands from entry, or of otherwise restricting their use, without even deigning to consult with those whose livelihood was going to be affected thereby. The outgrowth of that policy, of course, was the development of widespread bad feeling such as caused Sen. McCarren (D., Nev.) to observe in the Senate only the other day that it was high time Congress did something about the situation by putting "a curb on these long-continued, far-flung and irresponsible practices of the executive branch of the government with respect to the public lands."

Now, however, all is to be changed, for the new Secretary of the Interior has just issued regulations giving to all interested citizens full opportunity to express their views on any and all proposed future withdrawals of public lands for any purpose whatsoever.

"The people," said Mr. Krug, in announcing his action, "have a direct interest in the effect of a proposed withdrawal of public land upon their locality, and I welcome the co-operation of the public afforded under the new regulations, in a discussion and determination of the proposals."

No more refreshing statement has emerged from the Interior Department in all our time in Washington. It signals the beginning of a new day for the people of the West in their relationships with their government.

Mr. McIntosh

ATLANTIC COAST—By A. J. McIntosh

Extended Life Span of Autos Bodes Well for Oil Industry

A. J. McIntosh, economist with Socony-Vacuum Oil Co., Inc., is this week's guest Atlantic Coast columnist.

A recent release of the Bureau of Public Roads stated that during 1945 there was an increase of 570,000 registrations of all vehicles. Preliminary indications were for a decline of about 200,000.

Because passenger cars and trucks are the principal customers of the petroleum business, information regarding the number of these customers is of great importance.

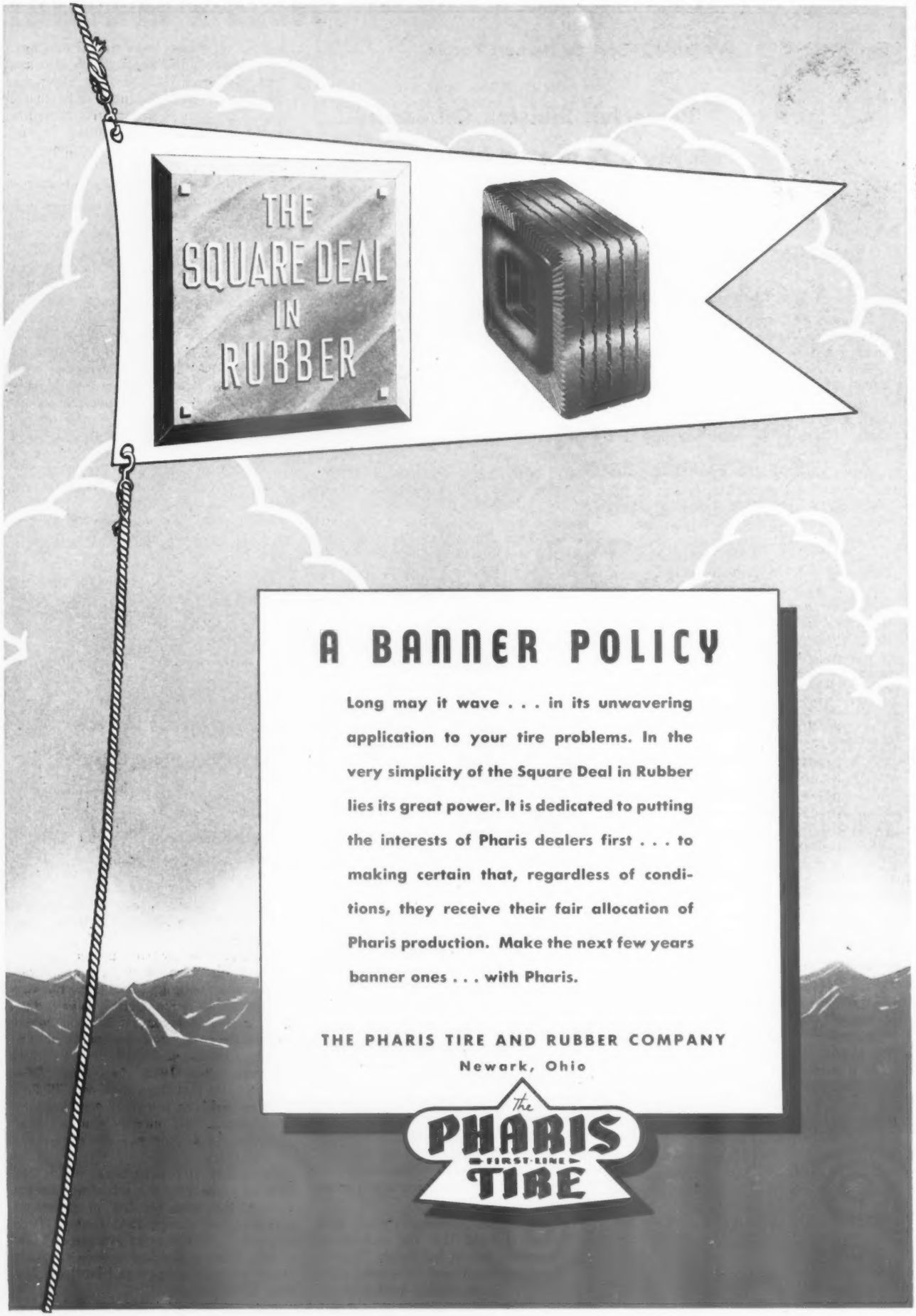
The report shows that the petroleum industry will be faced with the responsibility of fueling, lubricating and servicing more old cars—cars that have travelled greater distances and cars that have been in service longer—than wartime predictions indicated.

There were many estimates made back in 1941 and 1942 that the number of passenger cars would fall below 20,000,000 if the war continued for several years and that our transportation system would collapse without a great many new trucks. Now that the war is over we know that most of these predictions fell far short of the mark.

According to our calculations the lowest average number of passenger cars in use was about 25,300,000 for the year 1944. There were slightly more than this number in operation in 1945, which apparently came about by people returning cars to use that had been put into storage during 1942, 1943 and 1944. We estimate that there were over 700,000 of these vehicles stored at one time and later reused. The industry generally had assumed that 5,000 cars a day were going off the road.

According to calculations which can now be made from the actual registration figures, the total number of passenger cars scrapped during 1942 through 1945 was only 3,400,000 or an average of 2,400 a day. During the last couple of years it appears that scrappings have been less than 1,300 per day.

This further emphasizes that the war-



A BANNER POLICY

Long may it wave . . . in its unwavering application to your tire problems. In the very simplicity of the Square Deal in Rubber lies its great power. It is dedicated to putting the interests of Pharis dealers first . . . to making certain that, regardless of conditions, they receive their fair allocation of Pharis production. Make the next few years banner ones . . . with Pharis.

THE PHARIS TIRE AND RUBBER COMPANY
Newark, Ohio

The PHARIS FIRST-LINE TIRE

time prediction of 5,000 cars per day being scrapped was high.

We calculated that last year there were about 25,400,000 cars in use as compared with the all-time peak of 1941, which showed an average of about 27,500,000, actually a loss of only 2,100,000 cars considering annual averages. This small decline, as compared with most of the predictions which indicated a decline of seven or eight million, is a remarkable testimony for the service that can be obtained from our vehicles. At the end of 1941 there probably were 500,000 more cars in use than the average for that year. During the war we put into use approximately 600,000 new cars that were on hand at the end of 1941.

Trucks have followed quite a different course from passenger cars. The average number in use in 1945 represented an all-time high, as can be seen from table at right. During the early part of the war there were only small declines in the average number of trucks in use, which were quickly made up when the manufacturing of trucks for civilians was reinstated. Here again the number of trucks scrapped was considerably lower during the war years than had been anticipated.

Although table does not show the figures, similar conditions pertained to busses. During 1945 there were more busses in use than ever before. This is in spite of the decline in the number of school busses, which in some cases were changed to common carrier busses during the war. According to our method of calculation, there were practically no busses scrapped during 1943-44.

Looking into the future, it is possible that in 1947 the number of passenger cars in use on an average will exceed that of 1941, or at least equal it. Taking into consideration the larger number of trucks and busses used during 1945 and somewhat higher figures by 1947, it is calculated that the total of all vehicles in use by 1947 will be 33,100,000, which will be 800,000 above 1941. By 1950, passenger cars could very easily average 32,400,000 and all vehicles would then amount to 38,600,000. We have forecast that when new cars are manufactured in sufficient quantities (which may be late this year or early in 1947) the scrapping of old cars will step up considerably and exceed the old average. By 1949 we believe that for each 1,000,000 passenger cars manufactured and sold, 800,000 will replace old cars that will be scrapped permanently.

The war has clearly demonstrated that the average age and use of passenger cars, trucks and busses can be extended materially. The automobile industry is giving serious consideration to building trucks which will run one million miles and busses that will deliver two or three times that service. Several passenger car manufacturers are thinking of mileages well over 100,000 and cars approaching this mileage will not be considered "jalopies".

This leads to the conclusion, that even if the general economy should run into a recession in 1950 or thereabouts, there would be no reason for the petroleum industry to suffer because of lack of vehicles or new cars manufactured. The only thing that would greatly concern the petroleum industry would be the purchasing power of the nation.

Table below gives our calculations of the average number of vehicles in use, registered and scrapped during the last seven years. These calculations are made from detailed studies by groups of states and, therefore, may differ from similar figures published by others.

According to these figures the petroleum industry can count upon more customers this year than heretofore contemplated. In the future the average car will be older than it was before this war. These older cars may require more service and parts than the newer cars. The industry should recognize this change in its plans for the future.

Average Number of Vehicles in Use, Registered and Scrapped from 1939 to 1945§

(Thousands)

	All Vehicles Reported			Passenger Cars† Reported		Trucks (Excl. Busses) Reported		
Year	Average In Use	Registered	Scrapped	Average In Use	Registered	Scrapped	Average In Use	Registered	Scrapped
1939	29,675	31,152	2,180	25,109	26,342	1,789	4,434	4,671	377
1940	31,002	32,605	2,299	26,259	27,597	1,947	4,608	4,866	338
1941	32,377	34,927	3,315	27,491	29,654	2,701	4,750	5,127	595
1942	31,859	33,114	2,537*	27,021	28,081	2,256*	4,700	4,887	272
1943	30,514	30,981	892*	25,715	26,102	866*	4,655	4,727	25
1944	30,126	30,582	638	25,283	25,668	512	4,695	4,760	122
1945	30,298	31,156	600	25,301	25,914	488	4,844	5,080	100

* 1942-43 includes cars laid up and brought back into use in 1945—our estimate 715 (000) passenger cars.

† Includes dealer cars used with dealer plates—assumed 1 car per dealer plate issued and added to registrations and in use figures.

§ Busses not shown but are the resulting differences.

Mr. Lamm

MIDWEST—By Earl Lamm

Rails Battle to Hold Short Haul Petroleum Business in Midwest

Numerous changes in product prices and in rail and truck transportation rates continue to hold the spotlight in Midwest oil marketing.

Some important shifts are in prospect if present trends fully develop. Railroad representatives admit that "it looks like" pipelines and inland waterways are the winners in long hauls of petroleum from the Southwest since they ask 6c per 100 lbs increase on a nationwide tank car basis, while locally they propose substantial decreases in varying amounts.

Decision on whether or not lower intra-state proposed by railroads in Wisconsin are to be made effective is due after public hearing in Madison on August 9. Since ICC has already approved the reductions, only thing holding them up is the Wisconsin Public Service Commission.

No final action has yet been taken on the reductions in Illinois as proposed by Western Truck Line Freight Traffic Managers Committee on July 12, but next move is coming up Aug. 18 in Chicago at meeting of Conference Committee of Western Traffic Executives Committee, which will be attended by representatives of Southwestern lines, who are said to disapprove of the 6c, national increase.

With rails going after local short haul traffic from pipeline and water terminals, petroleum transporters are making a comparative check-up on their own rates. Some of them are confident they can hold the business where rail and truck rates are approximately the same. Others are not so sure and are asking or preparing to ask for reductions, while still others want increases based upon increased operating costs.

° ° °

That bid of Ryford Pipe Line Co. for the Little Inch, which includes proposed connections with inland refiners in Okla-

(*Continued on Page* 52)

Former High School Instructor, Now President of LPG Assn.

Charles Russell

Charles Oather Russell, president of the Liquefied Petroleum Gas Assn., is a former high school instructor in commercial and science subjects, who entered the LPG business 10 years ago when Thermogas Co. of Des Moines, Ia., which he heads, was organized.

As he sees it, one of the great LPG needs is for unification of thought and direction of effort in order that the door of industry opportunity, which is now wide open, may be expanded and fully rounded out. Rapid growth of the industry is anticipated during the next few years, and in his own affairs, Mr. Russell is keeping pace.

Three new 18,000-gal. storage plants have been added to Thermogas facilities already this year and two others are planned for early completion. Previously, the company had only one such plant, located in Des Moines. The entire state of Iowa is now being served on a wholesale basis, and trucks are daily crossing the line into six adjoining states of Minnesota, North and South Dakota, Nebraska, Missouri and Illinois. However, up to the present about 90% of Thermogas business is done within Iowa. Cylinders are delivered to approximately 300 dealers, who distribute them for both domestic and commercial uses.

In addition to his Iowa interests, Mr. Russell is president of Wisconsin Bottle Gas Co., Medford, Wis., and treasurer of Dairyland Gas Co. at Portage, Wis.

Mystic, Ia., about 85 miles southeast of Des Moines, had a population of 1700 when Mr. Russell was born there Sept. 18, 1907, and has not changed much since. The LPGA president received his early education there, graduating from high school in May, 1925. After school hours and during summer vacations, he worked at various jobs as most small town boys do, as messenger boy, or as soda jerker, at the local drug store. "Carrying" the *Des Moines Register*, collecting and soliciting new subscriptions, was another source of income for young Charles Russell.

After high school, he worked a year for Maquoketa Produce Co. at Maquoketa, then entered the University of Iowa for four years. He came out in 1930 with a B. S. degree in commerce, having worked between study hours as attendant at the university hospital and as school librarian.

Salesmanship appealed to him, and a year was spent on the road as sales representative of Vortex Co., which later consolidated with Dixie Paper Cup Co.

It was in 1931 when he left Vortex, that Mr. Russell taught commercial and science subjects for three years in high schools of Des Moines, where he became interested in liquefied petroleum gas. In 1935, he and Walter Shettlemore incorporated Thermogas Co., with Mr. Russell as vice president. A little later, Mr. Shettlemore sold his interest to Mr. Russell and Rufus Scott. Mr. Scott died in July, 1941, and the vice president became president and majority stockholder.

The company now has a capital and surplus of approximately $100,000.

Mr. Russell and Miss Leota Bucklew of Des Moines were married New Year's Day, 1931. Richard, 12, the only child, is now in the 7th grade at grammar school.

Fishing and cribbage are the principal hobbies of the president of LPGA, who participates in religious, local civic and fraternity activities through memberships in the Rotary and Advertising clubs, the YMCA, Elks Club and the Methodist Church. He owns a farm about 40 miles south of Des Moines where he raises hogs and sheep and keeps two saddle horses, which bring a thrill to young Richard.

War Assets Administration to Take at Least Month to Decide On 16 Bids Submitted for Big and Little Big Inch Pipelines

May Reject All Offers If None Measures Up to Policy; Thurman Arnold and Abe Fortas Assist Co-op Bidder

NPN News Bureau

WASHINGTON—War Assets Administration got down this week to the difficult task of trying to decide whether it can make a deal for sale or lease of the Big and Little Big Inch pipelines out of any of the 16 offers it has received.

Generally speaking, agency seemed hopeful of being able to dispose of at least one and possibly both of the lines exclusively for oil use, but it won't know as to that for another month or longer, job of reviewing bids opened July 31 promises to be that complicated.

Made pointedly clear by WAA, in the meantime, was the fact that it is reserving the right to reject all offers if, upon study, it finds that none of the petroleum-use offers are in accord with surplus disposal policy and objectives. Aim is to assure retention of lines in oil service, if at all possible, WAA asserting that it might even be "advisable to request further authorization from Congress before considering non-oil use."

Some Are Too Indefinite

Of 16 more or less firm offers received by WAA—agency itself noted that some bids may have to be rejected because they are "so indefinite"—six contemplated use of one or both of the "Inch" lines in petroleum service either to East Coast or interior points. No major oil company could be identified with any of bids, although in case of one—that filed by Ryford Pipe Line Co.—statement was made that "some" integrated major companies would assist in financing acquisition of 20-inch line if deal is ok'd by WAA.

Two bidders proposed operating the lines on a co-op basis, with particular interest centering on offer by a group headed by Dr. John Bauer, director of the American Public Utilities Bureau, because of association with the bidders as counsel of a couple of former top New Deal officials—Thurman Arnold of trust-busting fame and Abe Fortas, until recently Undersecretary of the Interior.

Offering $70,000,000 for the two lines, with payment to be in form of a loan from the government, Bauer said his group planned to organize a co-op to be known as the Mutual Oil-Gas Transmission Co. and to furnish crude and products and natural gas to East Coast oil refineries, oil dealers and gas manufacturers at actual cost.

Little Inch for Products

Big Inch would be operated on crude; the Little Inch as a products carrier, with one or both to be converted to natural gas service should assumed oil demand not materialized. Otherwise, group also would construct a new gas line of at least 30-inch capacity "to serve generally metropolitan New York, Philadelphia, Wilmington and Baltimore."

Bauer offer played up association of Arnold and Fortas with the group, describing the pair as having "exceptional qualifications in their acquaintance with the oil and gas industries and in their concern for the public interest as against speculative and monopolistic exploitation."

Also stressed were points that proposed co-op would "furnish a medium against actual or potential monopoly practices" and that pipelines under its management would furnish "a rough yardstick of reasonable transportation rates for localities served more or less under monopolistic conditions." Control of Mutual Transmission would be in a board consisting of representatives selected not only by oil and gas operators but also by city governments in the territories served; labor and management in the corporation; bond holders and other private creditors, and by federal agencies.

Summary of Other Offers

Summary of all other offers submitted to WAA follows:

Ryford Pipe Line Co., 333 N. Michigan Ave., Chicago, Paul Ryan, president—Offered $30,000,000 for outright purchase of 20-inch line, with 24-inch to be taken over also only if WAA insists on a tie-in sale, in which event company proposes leasing for successive 5-year periods up to total of 15 years, with option to buy outright at anytime on 6 months notice for $40,000,000 cash. Little Inch deal to be on basis of $15,000,000 cash (one-third down; one-third in 3 months; one-third upon completion of proposed feeder and distribution system), plus $15,000,000 in 20-year debenture notes paying 4% annually.

Operating plan calls for using 20-inch to reopen "high concentration profitable markets" in Illinois, Indiana, Michigan and Ohio to southwestern refiners. Eastward flow through line to be halted at Ohio-Pennsylvania border. Distribution lines to be constructed into each market area east of Mississippi and north of Ohio rivers, with refiners in Southwest to be tied into 20-inch line through expansion of present feeder system. Estimated cost of feeder and distribution lines $25-30,000,000.

Bidder has contacted "large number of refiners" and producers in Oklahoma, North and East Texas, Gulf Coast, Louisiana and Arkansas, of whom "all as individuals are interested in supporting this proposal . . . and will assist with their finances. the development and operation of these lines in the manner and for the purposes which we propose." However, because throughput and available capital of independent companies "do not appear sufficient to assure a sound economic operation," some major companies also have been contacted and these have "signified their intentions of utilizing lines and of co-operating with and supporting proposed operation, by furnishing crude and products for transportation and by making limited financial investments in non-ownership securities of the corporation."

If 24-inch line is acquired, bidder would place in crude service to refiners in Illinois, Indiana, Ohio and Kentucky, after constructing feeder lines tieing into West Texas fields, with service to East Coast also contemplated "if actual practice demonstrates that contiguously adequate markets exist for long term economic and profitable operation." Also, if changing economics or actual operations prevent obtaining net of 5% on invested capital, less profitable of

Policy on Inch Lines

WASHINGTON—Disposal policy being followed by WAA in trying to sell or lease Big and Little Inch pipelines was set out by Surplus Property Administration in a report to Congress last Jan. 4. That policy calls for:

1. First preference to be given to continuing both lines in petroleum service, (a) to the eastern seaboard, or, if this cannot be arranged, (b) to interior points.

2. Giving preference to private interests over any form of government financing, ownership or control, with terms of sale, however, to provide that properties are not to be resold, or basically altered in any way, that would materially affect or destroy their military value.

3. Making of a special effort to give small, independent oil operators, who cannot swing deal individually, opportunity of participating in a joint venture which would be of mutual benefit to all.

two lines would be converted to natural gas, and then, later on, perhaps the second as well.

Big Inch Oil, Inc., 41 East 42nd St., New York City—Bid of $110,000,000 for use of lines as common carriers in petroleum service. Company plans to spend approximately $20 million for construction of 20-inch feeder line from West Texas to western terminus of Big Inch. Intends operating as true independent common carrier of petroleum and products, serving big and small operators without discrimination. Would construct storage facilities for all shippers. Claims proposed operations would reduce cost to consumers, provide fair price to government and discourage monopolies.

Parallel 30-inch gas line would be constructed along present right-of-way. Will pay government $66 million in cash on date deal is closed and also deliver $44 million in income debenture bonds maturing in 30 years. Company reserves right to reverse flow of parts or all of both lines if economic conditions require; to remove portion of Little Inch between eastern Ohio and Linden, N. J. for relocation between West Texas and western terminus of Big Inch if this proves desirable, and to rearrange and relocate all distribution and feeder lines. Working capital of $10 million would be set up. Bid signed by Charles H. Smith, president.

Big Inch Natural Gas Transmission Co., 522 Munsey Bldg., Washington, D. C.—Bid $85,000,000 for two lines. Proposes to use exclusively in natural gas service. Offer excludes oil pumping stations, oil tank storage and all feeder lines not suitable for natural gas transportation. Will maintain all present facilities needed for petroleum transportation in order that they may be put back into oil use quickly and efficiently in event of an emergency.

Purchase funds, plus $35 million needed for conversion to gas service, to be raised through public sale of securities. Halsey, Stuart & Co., W. C. Langley & Co., and Otis & Co., have agreed to form underwriting group for all bonds to be sold to public, while similar group for sale of preferred and common stock will include Otis & Co., First California Corp., W. C. Langley & Co., and Butcher & Sherrerd.

President of company is Robert J. Bulkley, Cleveland, O., former U. S. Senator from Ohio who helped write Natural Gas Act. Directors besides Bulkley are James D. Miller, 140 Nassau St., New York City, and A. Faison Dixon, member of the firm of Brokaw, Dixon & McKee, geologists and engineers of Houston, Tex., and New York.

J. W. Crotty, 3710 University Blvd., Dallas, Tex., and associates—Proposes purchase of both lines for $127,500,000 for conversion to natural gas. Bidder at own option, however, could retain one in petroleum service. Government to have right to re-purchase both lines in event of another emergency with price to be fixed by board of appraisers and to be sufficient to insure against financial loss to private owners.

Proposes formation of corporation with a working capital of $160 million, including $32,500,000 for cost of converting lines, extension of gathering system and as operating funds. Terms of purchase to be $5 million upon execution of contract; balance in cash when lines have been placed in gas service, but within 3 years of execution of sales agreement.

Associates listed were Dr. Charles A. Pohl, consulting engineer of New York; H. R. Dillingham, New York, formerly chief engineer in charge of constructing Grand Central Terminal Development; Roy C. Foffee, former chief attorney for Lone Star Gas Co.; Hart Willis, attorney formerly connected with Southern Natural Gas Co.; Oswin C. Rowbotham, a legislative representative in Washington; Britt C. Canfill, oil and gas operator.

W. Lee Clements, Barton, Ark., and 707 Munsey Bldg., Washington, D. C.—Proposes creating a "marketing co-operative," composed of producers and distributors of oil and natural gas and of refiners, Co-op to lease lines for 25 years with option to buy at any time during that period. Alternate bids contemplate use of lines exclusively in oil service; combination of oil and gas, or exclusively on gas. Clements guarantees to make available to small operators 25 per cent of volume of products carried in any calendar year, provided they become members of co-op.

Terms of lease would provide for payment of fixed charge per bbl. delivered. Rental to be computed on basis of lines operating at 75 per cent capacity, so as to yield return, "when, as and if, earned and not otherwise," to U. S. of 7 per cent annually.

Sinclair Refining Co. expressed interest, but made no definite offer, in arranging deal for purchase and operation as common carriers of the Big Inch and Little Big Inch branch lines extending from Phoenixville, Pa., to New York Harbor area and Philadelphia. Company expressed belief acquisition of two branches by company it would consider forming would not materially interfere with WAA efforts to dispose of main lines. (At end of reading of Sinclair bid, WAA reader noted receipt of telegram "from Gulf Oil" in support of Sinclair proposal.)

Frank M. McCraw, 501 East 6th St., Anniston, Ala.—Offers to pay $146,000,000 for both lines, to be used as independent common carriers of petroleum and products, less depreciation deduction of 4 per cent per year from dates when lines began operations—Aug. 21, 1943 for Big Inch and March 2, 1944 for Little Big Inch.

To carry out purchase arrangement, bidder plans to raise $20,000,000 and make deposit of $8,000,000 in government bonds with WAA at time of closing sales contract. Subsequent payments to be made at rate of 8 cents per bbl., with minimum of $5 million per year, on oil transported through Big Inch, and 9½ cents per bbl. with minimum of $3 million per year, on products transported through Little Big Inch. All payments and deposits to apply on purchase price. Offer excludes power lines for pumping stations. Offer, signed only by McCraw, was made in behalf of himself and unidentified associates.

L. M. Glasco, Continental Bldg., Dallas, Tex., and associates—Proposes to lease Little Big Inch for 50 years, dig it up and relay it from Permian Basin in West Texas to California. Corporation to be formed would pay all costs of re-laying line, including right-of-way fees and services to obtain rights-of-way, but would require government financing to make possible proposed operation.

Corporation to put up 10% needed and borrow remainder on 10-year loan from RFC, same to be secured with first lien on the line. Lease contract provides for payment to government of 5 cents per bbl. on oil transmitted to the West Coast. Bidder stipulated additional signers could have been obtained had not bid been transmitted to WAA on Texas election day and many independent operators thus were unavailable. Will sign contracts with West Texas independents for transportation of their oil if bid is successful. In addition to Glasco, following were signers: E. B. Germany, Angus Wynne, Walter W. Lechner, and G. H. Vaughn.

McCarthy Oil and Gas Corp. (Glenn H. McCarthy), Shell Bldg., Houston, Tex.—Bids of $80,000,000, either in cash or installments, offered for both lines for conversion to natural gas transmission. Time payment offer includes $20,000,000 in cash at time of closing deal, $30,000,000 within 3 years and remaining $30,000,000 within 6 years, with right to liquidate unpaid balance at any time during life of payment period. WAA to receive interest of 4% per year on unpaid balance.

Bid was made subject to favorable FPC action in granting certificate of convenience and necessity to operate lines in interstate commerce. All capital for financing corporation, which McCarthy would organize if bid is successful, would come from private sources, not government loans. Provision made that all oil pumping equipment will be maintained in condition that lines can be reconverted quickly to petroleum use in event of national emergency. Purchase priorities to be given for domestic home use of gas in northeast U. S. Bidder said he has access to many millions of cubic feet of natural gas that would be

Scenes as Bids for Big and Little Inch Were Opened

ABOVE: Nearly 100 spectators, including several would-be owners of the two war-built projects, attended opening of bids for purchase or lease of Big and Little Inch pipelines July 31. It took WAA officials nearly five hours to read 16 bids, but audience stayed until finish

AT RIGHT: Grouped around David E. McPherson, assistant deputy administrator in WAA Office of Real Property Disposal, are three WAA officials who aided in opening of bids on War Emergency pipelines in Washington July 31 and who now have the job of analyzing and evaluating the offers for WAA. Left to right: J. Slater Jenner, Wilbert Fritz, Mr. McPherson and L. Gray Marshall, chief Utilities Branch, Industrial Division. Jenner and Fritz also are with the Utilities Branch and former played large part in drafting of policy being followed in attempting to sell or lease the "Inch" lines

flared away if he doesn't utilize it in proposed operation.

John R. Moroney, Majestic Theatre Bldg., Dallas, Tex. and associates—Offers to lease lines for 15% of gross income for 30 years with option to buy at any time during that period. Gross yearly income of $29,000,000 is anticipated. Lines to be used for whatever purpose is deemed desirable, including natural gas transportation. Group would form corporation for operation of lines if bid is successful. Moroney is general counsel for Interstate Theatres in Texas and president of Petroleum Royalty Corp., Dallas, Tex. Associates listed were R. W. Fair, Tyler, Tex., and Bert Aston, Roswell, N. M., both identified as oil operators.

E. Holly Poe, New York City, E. DeGolyer, Dallas, Tex., and others—Offered to either buy both lines outright for $80 million or lease the lines under 40-year arrangement calling for a minimum annual rental of $6,500,000. Rentals over 40 years would total $260,000,000. Purchase plan provides for cash payment of $80 million on delivery and a possible subsequent payment of $20 million, depending upon amount of gas transmitted. Both offers are for natural gas transportation.

Provides for maintenance of oil facilities for quick re-conversion to petroleum use, if necessary. Natural gas transported through lines would be used for blending with manufactured gas, thus, bidder contends, not seriously affecting coal industry in northeast sections. Corporation to be formed would be financed through a "nationwide banking syndicate." Associated with Poe and DeGolyer are Charles I. Francis, Herman Brown, and George Brown, all of Houston, Tex.

Noyark Oil Corp., 101 Cedar St., New York City, or 329 Kennedy Bldg., Tulsa, Okla.—Submitted one basic bid and two alternates, all stipulating use of lines as common carriers of petroleum and products. Basic bid called for purchase of entire systems of both lines for $80 million in first mortgage sinking fund bonds and all Class A common stock of corporation.

First alternate bid provides for purchase of only Big Inch system for $40,000,000 in first mortgage sinking fund bonds plus all of corporation's Class A common stock.

Second alternate calls for purchase of Little Big Inch for $40,000,000 in first mortgage sinking fund bonds plus all of Class A common stock. Latter bid is

conditioned on WAA action to re-locate southern terminus of Little Big Inch at Longview, Tex. If WAA fails to re-locate southern terminus, then bidder proposes to use line for 7 years as natural gas carrier, returning it to oil use at end of that period.

Ownership would be vested in corporation owned by a number of Independents along routes of lines, with no company to own more than 12½% of corporation's voting stock. Interest on first mortgage sinking fund bonds is not to exceed 4 per cent yearly. Class A common stock offered will receive 2/3 of all dividends of all classes of stock. Bid was signed by Henry M. Brooks, treasurer.

Russell Palmer of Washington, D. C., and London — Offers $135,000,000 if lines are used in petroleum service and $115,000,000 if lines are used for natural gas. Survey will determine use of lines. Purchase price would include first mortgage bonds, with interest payable semi-annually. Bidder anticipates bonds would be retired in 20 years. Payments will be made at rate of $8,050,000 yearly. Bidder and unidentified group of associates would raise $10,000,000 for working capital.

Provision is made that corporation to be formed would pay additional $20 million in event Big Inch is reconverted from natural gas to petroleum. Bidder is former vice president of Lago company and Creole Petroleum until they were taken over by Indiana Standard and Jersey Standard, respectively.

Transcontinental Gas Pipe Line Co., Inc., of Longview, Tex., and Washington, D. C. — One base bid and two alternates offered for use of lines for natural gas. Base bid calls for cash payment of $85,000,000 for both lines with bidder to begin $44 million worth of conversion work within 60 days after purchase.

First alternate bid is for purchase of Big Inch only for $54,000,000 cash with conversion work to begin in 60 days.

Second alternate offer is made on condition that first alternate bid is accepted, and calls for purchase within one year of Little Big Inch for $30,000,000 cash. Also, if first bid is accepted bidder will "explore" possibilities of using Little Big Inch for petroleum and products transportation before putting it into natural gas use.

"Exploring" would be done in conjunction with government. Bids are conditioned on issuance by FPC of proper certificate for natural gas operation. Bidder has already filed application with FPC. Pump stations, tank farms and other facilities not needed in connection with natural gas operation shall remain property of government and bidder will maintain them on stand-by basis for $280,000 per year from government.

Bidder has contracted for natural gas supply and for purchasers (5 major gas distribution firms in northeast). $14,000,000 of additional distribution lines will be constructed in metropolitan areas of New Jersey, New York City and Philadelphia. Total capital stock of $130,500,000 to come from following sources: Common stock, $12 million; preferred stock, $15,500,000; bank loan (commitment for substantial portion obtained from Chase National with Texas banks desiring to participate), $25 million; commitments from group of insurance companies to purchase $78 million in first mortgage bonds. Operating capital would be fixed at $1,500,000. Bid was signed by Claude A. Williams, president.

Syndicated Industries, Inc., 280 Madison Ave., New York City—Proposal to lease both lines for a 10-year period, with option to purchase at a price fixed by an arbitration board, and operate lines as common carrier of petroleum and products. Carrier rates to be based on cost of service, plus reasonable return on investment of company which would be organized as Petrol Carrier Corp. Government to be paid royalty, or rental, of flat ½ cent per bbl. of petroleum carried.

Toledo Refinery of Gulf Oil Released Aug. 3 by Navy

NPN News Bureau

WASHINGTON — Navy Aug. 3 released Toledo refinery of Gulf Oil Corp., last of 53 petroleum plants and pipelines remaining under government seizure ordered by President Truman last Oct. 4 in nationwide oil workers' strikes.

Company and union reached "complete agreement" conforming to general area practice, according to Capt. N. H. Collisson, acting officer in charge of Naval Petroleum Plants Office in absence of Vice Adm. Ben Moreell.

Gulf Toledo agreement includes provisions for 18% increase on return to 40-hour week, 4 and 6c shift differentials, $100-per-man retroactivity of pay and retention of seniority for 360 days with half that time conditional upon worker passing physical examination.

Research, Development Lab Planned by Pure in Illinois

NPN News Bureau

CHICAGO—Pure Oil Co. plans a new research and development laboratory at Crystal Lake, Ill., about 40 miles northwest of here.

Company has agreed to purchase 68 acres and tentative plans indicate construction cost will run about $400,000. Construction schedules will not be arranged until purchase of land and local re-zoning requirements have been completed. Pure has a small laboratory now located in Northfield, Ill.

New laboratory will be devoted to improvement of present products and processes of petroleum production, transportation, refining and marketing.

Legh-Jones Elected Chairman Of Board of Shell Union Oil

NPN News Bureau

NEW YORK—Sir Frederick Godber's resignation as a director of Shell Union Oil Corp. was received last week at a directors' meeting. He has been a member of the board since 1922 and chairman since 1937. He was at one time president of Shell Petroleum Corp. at St. Louis.

George Legh-Jones succeeds Sir Frederick as chairman of the board. Mr. Legh-Jones, for many years president of Shell Oil Co. in San Francisco is at present a managing director of Shell Transport and Trading Co. in London. He has been on the board of Shell Union since 1925.

To fill the vacancy on the board caused by the resignation of Sir Frederick Godber, the directors elected Frank J. Hopwood. Until recently he was president of Asiatic Petroleum Corp. in New York. He is now a managing director of Shell Transport and Trading Co.

OWMR, OPA, RFC Still Tussle With Stripper Well Subsidies

NPN News Bureau

WASHINGTON—Officials of OPA, RFC and OWMR met again this week to determine basis on which stripper well subsidies should be paid for August and succeeding months before final termination next April 1, after agreeing to pay July subsidies at rates in effect June 30.

Both OPA and RFC emphasized they had taken no stand in matter, merely intending to offer suggestions to OWMR, which must determine intent of Congress. OPA did suggest, however, that subsidy payments be cut 1/3 for last quarter of 1946 and an additional 1/3 for first quarter of 1947, in line with tapering-off requirement voted by Congress.

Under terms of agreement announced by OWMR Director Steelman, applicants may file claims for reimbursement of premiums paid during July to producers of stripper crude to extent that total price paid, including premium, exceeds either basic maximum price of crude in effect June 30 or posted price at time of purchase, whichever is higher. OPA was directed to certify new pools which qualified for subsidy payments.

Fate of OPA Fuel Price Division was undecided at NPN press time, although most employes of petroleum branch were expected to take jobs elsewhere in OPA and be available for recall if oil price controls are reinstituted. Small staff is expected to be retained to keep watch on oil price trends.

NPC Meeting Called Sept. 26

PITTSBURGH — Walter S. Hallanan, temporary chairman of National Petroleum Council, last week called meeting of NPC for Sept. 26 in Washington, D. C. He said he hopes to be able to mail in advance to all members a report on NPC organization and procedure.

Product Prices Rise Throughout Nation; Pennsylvania, California Increase Crude

Increases in Petroleum Prices Small Compared With Those of Other Commodities, Companies Point Out

By J. P. Mosher, Jr.
NPN Market Editor

NEW YORK — Higher prices for crude oil became nationwide the past week as major purchasers in Pennsylvania and California joined the upward swing which started in the Midcontinent July 25.

Boosts in refined products prices at all levels of delivery also spread to all parts of the country. There appeared to be no indication that sellers had any intention of absorbing increased raw material costs.

Statements issued by various companies in announcing price increases stressed rising costs during the past five years which OPA had failed to recognize in establishing ceilings for the oil industry.

"Higher costs in the production of crude oil, which until now have had to be almost totally absorbed by oil producers because of OPA regulations, will be reflected in (our) new posted prices," Standard Oil Co. of California declared in posting a 10 to 30c per bbl. increase in the posted prices it will pay for crude oil.

Standard's new crude price schedule became effective at 7 a.m. Aug. 1, and detailed postings may be found on page 61 of this issue.

Leading purchasers of Pennsylvania Grade crudes posted 25c per bbl. increases for all grades, effective Aug. 1.

Top price for Pennsylvania Grade crude now is $3.35 per bbl., as posted by Joseph Seep Purchasing Agency for Bradford-Allegheny oil in Bradford Transit and National Transit lines. The Seep agency also posted other Pennsylvania grades as follows: in southwest Penna. lines, $3; in Eureka (W. Va.) lines, $2.94; in Buckeye (O.) lines, $2.90. Corning (O.) was increased to $1.66 by Seep.

The Pennzoil Co. announced price of $3.28 per bbl. for Pennsylvania Grade in Cochran, Franklin, Hamilton and Doolittle districts (National Transit lines) with prices in four other lower-field Pennsylvania districts ranging down to $3.23.

Definite Subsidy Policy Awaited

While it was generally believed in oil trade circles that amounts of increases posted by crude oil buyers will be deducted by RFC from the rates of subsidy payments prevailing in various parts of the country beginning in August, a definite policy had not been established by RFC at NPN press time.

Wholesale prices for refined products in some 20 odd states were affected by increases posted by Standards of California, New Jersey and Kentucky.

Coincident with its Aug. 1 crude price advance, the California Standard advanced its tank wagon prices for all grades of gasoline, kerosine, thinners, solvents and liquefied gases 1c per gal. at most points in California, Arizona, Nevada, Oregon, Washington and Idaho, and stated that further light increases will be made in some inland areas to cover higher freight rates recently authorized.

"Gasoline and most other petroleum products are among the very few commodities that did not go up in price either during the war or in the first year following the war," the California company declared.

Standard of New Jersey's increase in tank wagon prices effective Aug. 1 covered gasoline, kerosine, and light fuels in the nine eastern and southern states where it markets and the District of Columbia.

Gasoline price increases ranged from 0.2c at Lake Charles, La., to 1c per gal. at Little Rock, Ark., Bristol Tenn., Washington, D. C., and all New Jersey points. All North Carolina points were up 0.5c, South Carolina points, 0.7c.

Kerosine was up 0.6c at all points except Danville and Roanoke, Va., Raleigh, N. C., Knoxville, Tenn., Charleston, Parkersburg and Wheeling, W. Va.; prices were unchanged at all these points. (See page 58 for S. O. New Jersey's new prices).

Boost Amounts to Less Than 3.5%

With the 1c increase throughout the state of New Jersey, Standard's new tank wagon price to 100% dealers for regular-grade gasoline is 9.7c, ex all taxes, and the company pointed out that this represented an increase of less that 3.5% over its August, 1941, price of 9.4c.

"It is of interest to compare this figure with a relative figure for the increase in the government wholesale commodity index, which has gone up 22.9% since August, 1941," the Jersey Standard said.

Gasoline prices were up 1c, kerosine 0.7c in Kentucky in the higher tank wagon schedule posted by Standard of Kentucky on Aug. 2; Mississippi, Alabama, Georgia and Florida points were all up 0.75c on gasoline, 0.6c on kerosine, with the exception of Jackson, Miss., where kerosine increase was 0.65c. (See page 58 for new prices posted by Standard of Kentucky.)

Tank car markets for all products continued the upward trend which was touched off by the advance in crude.

Gasoline prices were up approximately 1c per gal. in the leading refinery and terminal markets. NPN tank car gasoline index hit 7.21 on Aug. 5, compared with 6.67 on July 29.

Kerosine and light fuels generally were up 0.5c. Increases in heavy fuel prices ranged from 10.5 to 30c per bbl. Jersey Standard advanced its worldwide schedule for bunker "C" fuel 20c per bbl.

Refined Products Price Gains Uniform

By NPN Staff Writer

NEW YORK — Increases in refined products prices following recent rise in crude appear to be fairly uniform at all levels of delivery—cargo, tank car, barge, tank wagon and retail—according to reports in eastern and midwestern areas.

In the main, prices below retail level have risen 1c per gal. for gasoline, 0.5 to 0.6c per gal. for distillates and 10.5 to 30c per bbl. for heavy fuels.

From some sources there have been reports that gasoline dealers have boosted prices at service stations by more than the amount of the increase in their cost of tank wagon deliveries, in some instances as much as 1c. In other words, the charge has been made that the dealer, with a 1c increase in his cost price, has raised his price at the station as much as 2c per gal.

Some instances of "rounding out" of prices have been heard—the dealer with an increase from 19.8c to 20.8c in his tank wagon cost advancing his service station price to 21c, but even this is said to be scattered.

"Isn't the dealer entitled to figure some increase in his cost of doing business," one large retail operator commented when asked why he had advanced his pump price 1.2c with only a 1c increase in his cost price.

Midwest operators, for most part confined raises to 1c or 1.1c though a few instances of advances above tank wagon increase have been reported. In Milwaukee, for example, branded retailers boosted station price 1.5c or 0.4c more than tank wagon increase of 1.1c to offset their increased operating expenses.

And in Lincoln, Nebr., dealers took a 2c advance compared to tank wagon increase of 1.1c. At Kansas City dealers advanced price same as tank wagon boost—1c.

Carbon Black Controls Off

WASHINGTON—Price controls on carbon black were removed by OPA Aug. 2.

Order affects both ordinary channel black used in rubber production and premium channel blacks selling for 6c or less at manufacturing level.

Jobber Council Acts On API Board Plan At Aug. 19-20 Meeting

Special to NPN

CHATTANOOGA, TENN. — National Council of Independent Petroleum Assn. will consider at its next meeting in Indianapolis Aug. 19-20 the offer of API to place the council chairman and three state marketing association representatives on the API board of directors.

Hugh L. Thatcher, chairman of the council, was officially notified of API's action in a letter dated July 19 from API President Boyd.

"It is our effort," Mr. Boyd's letter read in part, "to make the institute's board fully representative of the entire petroleum industry and it is my earnest hope that your association will feel it will serve a useful purpose for your constituency to have its president sitting with other representative men of the industry in a place where over-all national problems are being considered."

Mr. Boyd's letter stressed that the Independent marketers, as well as other Independents to be included under the expansion program, will have "all and full privileges of membership."

The council meeting was originally scheduled for Chicago, but was moved to Indianapolis because proper accommodations could not be secured in Chicago hotels. The meetings will be held in Room 1224 of the Hotel Severin, Indianapolis. Sessions will start at 10 a.m.

API Board of Directors Meet In Washington September 25

NPN News Bureau

NEW YORK — Meeting of API board of directors has been called for Sept. 25 at Carlton Hotel, Washington, to discuss major changes contemplated in program for the institute's 26th annual meeting in Chicago in November, President Boyd said this week.

Principal changes contemplated are to enlarge program and to increase the number of addresses and events of general interest in line with announced institute policy of broadening the scope of its work.

Directors meeting will precede by a day meeting of National Petroleum Council in Washington.

Steel Drum Industry Asks For More Sheet Steel

NPN News Bureau

WASHINGTON—Increased shipments of steel sheets must be provided steel container industry to assure adequate deliveries of many reconversion materials, including petroleum products, steel shipping containers Industry Advisory Committee has told CPA.

Agency countered with statement that sheet steel shortage is general in all industries but that new rolling facilities, expected to be completed within next six months, will help relieve situation. CPA asserted any effort to extend priorities aid to container producers would dislocate present shortage.

Container industry representative told CPA that users now are obtaining only 30 to 35% of requirements. Agency estimated that June production was somewhat lower than output in May.

In latter month, 1,861,455 heavy steel drums and 812,219 light drums were produced. At end of May unfilled orders totaled 8,631,644 for heavy types and 2,824,000 for light drums.

Meanwhile, CPA outlined plans to recover about 700,000 tons of steel and iron scrap by dismantling about 280 surplus ships, first step in program which ultimately may swallow up 1,280 overage vessels. Plan was given to members of Ship Breaking Industry Committee, including John Pew of Sun Shipbuilding.

Calendar of NLRB Decisions Involving Oil Companies

NPN News Bureau

WASHINGTON — Recent developments in NLRB cases involving oil companies have been reported by the agency as follows:

Certifications

Standard Oil Co. (Ohio) (Case 8-R-2133), Cleveland, O. Election held July 15 pursuant to stipulation. Certified (for maintenance and operations employes of company's Cleveland Sales Div.): Indep. Petroleum Wkrs., Inc., which received 186 out of 249 valid votes cast. OWIU-CIO received 41 votes; 22 were for neither. Unit includes drivers, bulk station agents except agent at Nobel, loaders, warehousemen, garagemen, recappers and maintenance employes including burner service and installation employes, but excludes clerical, part-time and technical employes and supervisory employes.

Canfield Oil Co., Plant No. 1 (Case 8-R-2147), Cleveland, O. Prehearing election conducted. Certified (for all production and maintenance employes, excluding clerical employes, a grease maker and all supervisory employes): OWIU-CIO, which received 20 out of 23 votes cast. Two votes were against union and board sustained company's challenge to vote of grease maker, who was found at hearing to be supervisory employe under board's customary definition.

Pure Oil Co., Cincinnati, O. (Case No. 9-R-2241). International Assn. of Machinists certified as collective bargaining agent for all garage, pump and tank maintenance men at company's bulk plant at Cincinnati, excluding office, clerical and supervisory employes. IAM chosen by 10 to 5 vote on July 16.

Tidewater Associated Oil Co., (Associated Division) Wilmington, Calif. OWIU-CIO certified as collective bargaining representative for all clerical employes of the company's Watson Refinery office, including the accounting department and office engineer, but excluding production and maintenance employes, confidential employes, telephone operators, and supervisory personnel with authority to hire and fire. In voting, union received 10 of 12 votes cast.

Pure Oil Co., Cincinnati, O., (Case No. 9-R-2234). By vote of 14 to 4, Petroleum Haulers, Garage, Station and Parking Attendants, Local 103 of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America, AFL, was certified as bargaining agent for the following: all employes in the Grease and Lube Oil Departments of the Cincinnati Terminal of Pure, excluding clerical and supervisory personnel.

Direction of Election

Sinclair Refining Co. (Case 2-R-6346), New York. Elections within 30 days of July 26. (1) Superintendents and foremen and (2) chief clerks will vote for or against representation by Indep. Petroleum Supervisors' Assn. Board Member Reilly, in a separate opinion, dissents for reasons stated in his dissenting opinion in Matter of Jones & Laughlin Steel Corp. Unit No. 1 includes all plant superintendents, assistant plant superintendents, plant foremen and construction and equipment foremen employed at the company's bulk storage plants at Great Neck, Oceanside, Port Jefferson, Huntington, Patchogue, Bridgehampton and Garden City, L. I., and Mt. Vernon, Mill Basin, Newton Creek and Verplanck, N. Y., but excludes all agents and assistant agents. Unit No. 2 includes all chief clerks at those bulk plants, but excludes all agents and assistant agents.

Get FPC Gas Record Ready for Congress

NPN News Bureau

WASHINGTON — The long-winded FPC Natural Gas investigation finally talked itself out last week as Commissioner Nelson Lee Smith declared the formal hearings closed and clerks began preparing a voluminous record for submission to Congress.

In his closing statement, Mr. Smith said FPC will accept "concise summary statements of position and recommendations" of interested parties until October 1, instead of 30 days following conclusion of the Washington hearing as announced earlier.

"The commission will, before transmitting a report to Congress, submit for the consideration and comment of the interested parties who have participated actively in this investigation the principal findings and conclusions reached," Mr. Smith stated.

The commissioner said it would be impossible to estimate when the report and recommendations would be completed because of the large amount of testimony and exhibits to be included in the record. Lengthy testimony and numerous exhibits were introduced by gas, coal, railroad and coal-railroad labor groups.

Natural gas industry witnesses took position it is entitled to opportunity of expanding industrial and domestic markets in northeast section of U. S. and other areas while coal and railroad combine asserted any extension of natural gas to northeast section world seriously disrupt coal and railroad industries.

Mr. Smith said "broad scope" of the inquiry had been justified as only means whereby a comprehensive understanding of the relationship of the natural gas industry to its proper regulation in the public interest could be achieved.

Lawyer Named Civilian Chief Of Japanese Oil Refining

NPN News Bureau

WASHINGTON — Campbell Osborn, Washington oil attorney and former assistant (1919-1927) to president of old Marland Oil Co., will sail for Tokyo Aug. 15 where he will be member of Gen. MacArthur's staff as civilian chief of Japanese chemical and petroleum refining industries.

Osborn served as assistant director of WPB Chemical Division, resigning last fall. CPA, successor to WPB, said Osborn also was head of cotton linter section of Chemical Division. Osborn said Far East appointment was made by War Department headquarters here.

Tidelands Issue Now Up to U. S. Supreme Court After Congress Fails to Override Truman Veto

NPN News Bureau

WASHINGTON — It's now strictly and solely up to the Supreme Court to decide the question of who owns the submerged lands off the shorelines of California and other coastal states.

President Truman settled that much July 30 by vetoing legislation which would have quieted title in favor of the states, thus leaving the Supreme Court free to pass on the ownership issue as raised in the suit against California filed by the attorney general at the behest of the chief executive.

There was a perfunctory attempt made in the House the next day to override the veto, but the resulting ballot (139 to 95) failed by 17 votes of attaining the necessary two-thirds.

The Senate, as a result, was not required to act. But the veto was not allowed to go unmentioned in that body, Sen. E. H. Moore (R., Okla.) taking a minute on the closing day's session of the 79th Congress to tell his colleagues:

"Mr. President, the tidelands bill, just vetoed by the President for political capital was, in effect, a congressional statement of national policy that integrity of states' rights to tidelands should not be disputed. The veto is a denial of congressional will on questions of national policy contrary to well established law. The smear of the oil industry was used as a smoke screen to divert the public from the fact that control of their rivers and harbors, including all state and private installations, are now under cloud of title."

In his veto message, the President reminded Congress that the original suit asserting the government's claim to submerged coastal lands within the 3-mile limit was filed in District Court in California "at my direction."

Reciting that ownership of the land and resources underlying the waters in the 3-mile belt had been "a subject of genuine controversy" for several years, he declared:

"If the United States owns these areas, they should not be given away. If the Supreme Court decides that the United States has no title to or interest in the lands, a quitclaim from the Congress is unnecessary."

By way of clarification of the government's position, President Truman said the court's decision will determine rights in lands "lying beyond ordinary low-water mark along the coast extending seaward for a distance of 3 miles.

"Contrary to widespread misunderstanding," he declared, "the case does not involve any tidelands, which are lands covered and uncovered by the daily ebb and flow of the tides; nor does it involve any lands unders bays, harbors, ports, lakes, rivers, or other inland waters. Consequently the case does not constitute any threat to or cloud upon the titles of the several states to such lands, or the improvements thereon. When the joint resolution was being debated in the Senate, an amendment was offered which would have resulted in giving an outright acquittance to the respective states of all tidelands and all lands under bays, harbors, ports, lakes, rivers, and other inland waters. Proponents of the present measure, however, defeated this amendment. This clearly emphasized that the primary purpose of the legislation was to give to the states and their lesssees any right, title, or interest of the United States in the lands and minerals under the waters within the 3-mile limit."

Mr. Truman contended that the phrase in the joint resolution locating the areas at issue as "lands beneath tidewaters" was defined in the measure "so broadly as to include all lands, either submerged or reclaimed, situated under the ocean beyond the low-water mark and extending out to a line three geographical miles distant from the coast line or to the boundary line of any state whose boundary, at the time of the admission of the state to the Union, extended oceanward beyond three geographical miles."

"Lands acquired by the United States from any state or its successors in interest, or through conveyance or condemnation, would be excluded from the operation of the measure," he continued. "There would also be excluded the interest of the United States in that part of the Continental Shelf—lands under the ocean contiguous to and forming part of the land mass of our coasts— which lies more than 3 miles beyond the low-water mark or the boundary of any particular state."

D. J. Gets Until October 15 To Answer Sun's Queries

NPN News Bureau

WASHINGTON—District Judge Matthew F. McGuire has granted motion of Justice Department for extension of time to Oct. 15 for studying, objecting to, or answering 61 interrogatories put forth by Sun Oil Co. in API antitrust suit.

Department said interrogatories were so complex that it is unable to analyze them and either prepare its objections or answers to them in 15 days allowed under court rules.

"Interrogatories are of such a nature," Justice said, "as to require plaintiff to prepare a complete trial brief as to all defendants as well as defendant Sun Oil Co. within period of time permitted by Rule 33 (of federal rules of civil procedure) plaintiff would be unable to analyze and comply with questions propounded by this defendant.

"Plaintiff desires time in which to appraise the interrogatories and be in a position either to answer some questions or object to others without being compelled to serve this defendant with complete trial brief."

Texas Production Days For August Cut by 2

Special to NPN

AUSTIN—Because the West Texas District is producing more oil than can be moved to market, Texas Railroad Commission has reduced by two the number of production days for the district this month.

West Texas was cut from 24 to 22 days, compared with 26 for the state as a whole.

Commission Chairman Olin Culberson commented that he did not like to assume an "I told you so" attitude, but that he could not refrain from calling attention to his consistent opinion that instead of accepting purchaser nominations as the measure of demand for crude, more attention should be given to Bureau of Mines estimates.

"Some three months I voiced my fear of growing storage and its effect upon the industry," he said. "We now have a greatly increased volume of crude above ground and storage is gradually increasing. I do not think this is a healthy condition and am glad to see that the commission is gradually getting back to a figure which I believe is more nearly the consumptive demand experience."

Railroad Commission Aug. 5 reduced allowable of Wasson Field of West Texas by 4000 b/d to a new daily allowable of 62,000 b/d. Cut was effected by reducing operating days for month from 31 to 29. Commission said increasing storage and transportation difficulties caused cut.

Wasson was exempt from earlier order. Aug. 5 cut made total West Texas cut for the month over 90,000 b/d.

Surplus Valves, Pipe Fittings Are Placed on Sale by WAA

NPN News Bureau

WASHINGTON — WAA has announced opening of sale of surplus valves and pipe fittings, which cost government more than $100 millions, to all classes of purchasers.

Valves and fittings include commercial, industrial, Navy, Maritime and other special types. WAA said Navy types consist of many items adaptable to industrial and commercial piping applications.

Standard commercial items, about 1/3 of total inventory, will be sold at fixed prices while the balance, or special types, will be offered on a sealed-bid basis. Sales will be handled by WAA's regional offices.

Declares Grand Jury Can Aid Mich. Jobbers

Special to NPN

DETROIT—July issue of *Michigan Petroleum News* declares one-man grand jury now meeting here, investigating Teamsters' Union may well affect the future relationship between labor and the oil jobber. Terming methods of the Teamsters as "extortion in the simplest and most vicious form," *Petroleum News* states:

"The one-man grand jury now meeting in Detroit investigating Teamsters' Union may well affect the future relationship between labor and the petroleum jobber. The Teamsters' Union has been exceedingly active in attempting to organize drivers of all industries, and in devoting a great deal of time toward the petroleum industry. There is a particular reason for the Teamsters' Union to focus its attention on the petroleum business because its rival union, the Oil Workers' CIO, has gotten pretty much of a head start and the Teamsters feel that the CIO is invading its bailiwick. As a result, a rivalry has built up between the two, and the petroleum industry may well find itself in a squeezed position on a jurisdictional fight between the two.

"The result of the grand jury could put a stop to the extortion methods being pursued by the Teamsters. These methods we have seen operate with the grocers, the florists, and the undertakers. It's extortion in the simplest and most vicious form, the same type which we saw used in prohibition days with the so-called Protective Associations.

"Judge George B. Murphy of the Wayne Circuit Bench has been appointed the one-man grand juror and is being assisted by Special Prosecutor Lester S. Moll, former circuit judge. Already one of the union organizers has been sent to jail for contempt of court. We may well hope that this is just the beginning, and that a thorough and complete investigation will be made of all activities of this particular union. If the grand jury is successful in exposing this highly intensified racket, then perhaps it may serve as the springboard to investigate the same type of operations of other unions.

"All of this will certainly affect the future methods to be followed by unions in general and, particularly, those which have sought to organize the petroleum industry."

U. S. Appeals Judgment In Patent Seizure Case

NPN News Bureau

WASHINGTON — Justice Department took an appeal this week from a federal court judgment ordering transfer to Standard Oil Co. of New Jersey and affiliated companies of certain patents and other property seized by Alien Property Custodian as belonging to I. G. Farbenindustrie.

Appeal opens a new chapter in suit begun by Standard companies in July, 1944, to back contention that property seized by APC as property of I. G. actually belonged to them as result of transfers from I. G., some long before and some soon after outbreak in Europe of World War II. Court ruled against Standard group as to most of the transfers, sustaining U. S. contention that they were "sham transactions," but upheld companies on others, so Justice now is appealing "for further relief" according to announcement here by Attorney General Clark.

Only the part of lower court judgment which awarded property to Standard group is involved in the appeal. Government position is that I. G. always remained real owner of this property, and that any contractual rights of Standard were based upon unlawful cartel agreements and therefore unenforceable.

A further contention is that Standard's standing to sue under the Trading with the Enemy Act was impaired by its having acted for benefit of I. G., a national of Germany, in transactions "designed to conceal I. G.'s interests from U. S. government."

Claims Court Is Instructed To Report on Petrol Claim

NPN News Bureau

WASHINGTON—In last-minute action before adjournment, Senate passed resolution (S. Res. 321) by Senator Johnston (D., S.C.) conferring authority on Court of Claims to report back to next Congress on bill (H. R. 6112) for relief of Petrol Corp.

Claims court is instructed to report to Senate "such findings of fact and conclusions thereon (on H. R. 6112) as shall be sufficient to inform Congress of the nature and character of the demand, as a claim, legal or equitable, against the United States, and the amount, if any, legally or equitably due from the United States to the claimant."

House bill, if enacted, would have directed RFC to submit to arbitration Petrol's claims for excess transportation costs incurred from Sept. 1, 1941, to Oct. 10, 1945, while operating outside DSC pool.

Area Petroleum Officers Are Set up for the Atlantic

WASHINGTON —Area petroleum offices were commissioned Aug. 1 for North and South Atlantic which will relieve Navy's Bureau of Supplies and Accounts and A-NPB of certain operating problems and permit A-NPB to concern itself exclusively with staff control of military petroleum matters in Atlantic as in Pacific.

North Atlantic APO, headquartered with commander of service force, Atlantic Fleet, will be responsible for operations north of 20th parallel, including Cuba. South Atlantic APO will be at headquarters of commanding general, Caribbean Defense Command, Balboa.

Assign Army Officers For Industry Training

NPN News Bureau

WASHINGTON — Assignments were announced Aug. 2 by Fuels and Lubricants Branch, OQMG, for training in industry of first group of officers being groomed by Army for responsible stations in military petroleum activities. (See story on p. 28.)

Plan is to have each officer spend year in an assigned company's various departments upon completion of year's schooling in petroleum engineering, said Col. G. H. Vogel, Fuels and Lubes Branch director.

Members of the present group, working for master of science degrees at University of Pittsburgh, are slated to go into industry next Feb. 1 for grounding in production, refining, transportation, terminals and distribution as follows:

Maj. C. E. Danforth, OQMG, Standard Oil Co. (Ohio); Lt. Col. Leon Stann, AAF, Standard Oil Co. of New Jersey; Lt. Col. M. J. McKeever, AAF, Sun Oil Co.; Maj. H. J. St. Clair, Engs., Shell Oil Co, Inc.; Lt. Col. Morton Singer, OQMG, Gulf Oil Corp.; Lt. Col. C. M. Ulm, OQMG, Cities Service Oil Co.; Capt. R. T. Schlosberg, AAF, Socony-Vacuum Oil Co., Inc.; Capt. D. J. Kitch, Paratroop Inf., Pan American Petroleum & Transport Co.; Maj. William L. Latta, Inf., The Texas Co.

Yet to be assigned, probably to West Coast companies, are Lt. Col. C. F. Matheson, AAF.; Maj. Richard Moushegian, Inf., and Capt. A. B. O'Brien, OQMG.

Proposed industry indoctrination program for U. S. Army officers follows:

Production (one month)—Exploration; drilling methods; crude gathering and storage.

Refining (2 months)—Major refining operations, associated with the manufacturers of marketable products from crude; product testing and inspection (one month); product research; grease manufacture; drum reclamation.

Transportation (4 months)—Tankers, ocean and coastal; barges, inland waterway and lightering; pipelines, crude and finished product; rail; transport; safety methods.

Terminal operations—water, rail and pipeline (3 months)—storage; product handling; distribution methods; warehousing; drumming, filling and inspection; safety methods; maintenance; accounting.

Distribution (2 months)—Bulk plant operations, including receipt and handling of product, truck loading, truck routing, safety methods and accounting; retail S.S., including operation, equipment, maintenance, accounting and housekeeping.

Navy Picks 6 Types of Fuel for Diesel Test

NPN News Bureau

WASHINGTON—Six types of Diesel fuel, including straight petroleum and blends of synthetics and petroleum, were selected Aug. 6 by Navy's subcommittee on special fuels evaluation as samples to be used in private industry tests of Diesel engines.

Selections were made at meeting attended by Navy technical research experts, Capt. Biggs of A-NPB and representatives of petroleum and Diesel engine manufacturing industries. Industry men indicated their willingness to carry tests which Navy hopes will help make Diesel units more efficient and provide research data for development of additional Diesel fuel supply.

Capt. W. C. Latrobe, who presided, said any industry sources desiring to participate in testing program can obtain free samples of six types of fuel by writing either to Navy's Bureau of Ships, Washington, D. C., or to Naval Engineer Experiment Station, Annapolis, Md.

Types chosen for tests are 30 and 50 cetane, both straight petroleum products; 87 cetane Fischer-Tropsch liquid, obtained by Navy in 1944 from France, derived by coal synthesis; blend of Fischer-Tropsch liquid and 50 cetane fuel, producing about 68 cetane oil; blend of Fischer-Tropsch liquid and 30 cetane, resulting in about 50 cetane product; 50 cetane fuel composed of blends of 30 cetane plus 50 cetane plus an additive.

A Navy speaker said department hopes to have sufficient test results within 12 months so that an evaluation can be tentatively made on performance of present conventional type of engines using six samples. Various methods of standardizing testing procedures also were discussed by group, which is subdivision of Navy Co-Operative Committee on Fuels and Lubricants, established in 1932.

Continental Oil Dismantling Refinery at Baltimore

PONCA CITY, OKLA.—Continental Oil Co.'s 7,500 b/d Baltimore, Md., refinery is being dismantled and converted into terminal facilities, and eastern marketing division will be supplied from company's Lake Charles, La., refinery by tanker. Company spokesman said reason for move was that better products could be made at the newer and larger Lake Charles plant which was completed shortly before the war. Refinery, which has four thermal cracking units, has a capacity of 8,000 b/d.

Oklahoma Antidiversion Statute Sought by Highway Association

Special to NPN

OKLAHOMA CITY, Okla.—Oklahoma is seeking a statute outlawing diversion of highway users' tax revenue to unrelated purposes. Copy of the proposed amendment has been filed with Oklahoma's secretary of state. It will be referred to the electorate if the required signatures for initiative petitions are secured.

Early R. Cass and William E. Lorenz, both of Tulsa, president and secretary respectively, of the Oklahoma Highway Development Assn., filed the amendment and initiative petition forms.

The amendment would provide that all highway users' tax funds including gasoline taxes, in excess of costs of collection shall be used only for highway purposes including construction, maintenance, administration and for a state highway patrol organization.

Hint D. J. Plans Oil Suit

Reports are current that Justice Department is preparing to file suit charging exclusive dealing practices in petroleum industry, culminating long and extensive investigation by FBI which began on West Coast and later was extended to include most of country. D. J. has filed four similar actions in other industries within past week.

Unfair Sales Practices Act Upheld by Wisconsin Court

Special to NPN

FOND du LAC, Wis.—Wisconsin's Unfair Sales Practice Act has been upheld here by Circuit Judge L. J. Fellenz, Sr. The act is designed to curb predatory merchandising competition of the "loss leader" type.

The opinion was handed down in denying a motion for summary judgment by Tankar Gas Co., Inc. This company had been charged with violating the act by offering two gallons of gasoline free with each purchase of seven gallons.

The company challenged the constitutionality of the Unfair Sales Practice Act, and denied that it had violated the statute's provision.

"It is clear," the court ruled, "the legislature intended by enactment of the Unfair Sales Act to prohibit merchants from using means and inducements which unfairly divert trade from competitors."

Authority to Set Auto Service Prices Granted OPA in Region 5

NPN News Bureau

WASHINGTON — OPA regional administrator for Region 5 has been granted authority to establish maximum prices for automobile washing, greasing, polishing, tire changing and battery services in that region as result of numerous applications for individual price adjustments.

Action was taken in Amendment 8 to Revised Supplementary Service Regulation 50 issued under RMPR 165, effective Aug. 12. Region 5 includes Texas, Arkansas, Kansas, Louisiana, Missouri and Oklahoma.

Seek Change in North Dakota Gasoline Tax Collection Law

Special to NPN

BISMARK, N. D.—North Dakotans want to change their law exempting non-highway gasoline from taxation to one requiring payment of tax on all gasoline, then refunding that on non-highway.

Petition with more than 14,000 signatures requesting change has been filed with Secretary of State Tom Hall, which, he said this week, definitely puts the matter on the general election ballot for Nov. 5. Hall told NPN that during the four years present law has been on statute books, gasoline tax collections in this state have dropped to "less than one third" of what they previously were.

A citizen's committee, he said, circulated the petition.

Liquid Fuel Stove Production For June Exceeds May Total

NPN News Bureau

WASHINGTON—June production of liquid fuel ranges, cook stoves and heating stoves increased slightly over May output while backlog of unfilled orders at end of June were numbered in the millions, Commerce Department reported July 30.

Total of 44,350 ranges and cook stoves were produced compared with 41,225 in May. June shipments totaled 40,819 and were valued at $1,280,633. Backlog of unfilled orders rose to 864,403 from May level of 822,730.

Output of heating stoves reached 81,050 compared with 80,105 in previous month. Shipments totaled 77,969 and were valued at $2,381,780. Unfilled orders at end of June increased to 2,089,389 from May total of 1,932,039.

Large Scale Rubber Imports To Be Continued by U.S.

NPN News Bureau

WASHINGTON—Despite policy of returning import trade to private channels as soon as possible, non-military federal agencies will continue large scale purchases, particularly of rubber from Far East, Commerce Department said this week.

Government is expected to spend about $70 million for rubber imports from Far East during last half of 1946, department related. Also, it is expected to continue purchase of Liberian rubber and most of exportable rubber surpluses of Latin American countries under contracts running through June 30, 1947.

Cuts Import Duty on Fuel Oil

WASHINGTON — Commerce Department's Office of International Trade reported France has reduced special import duty on fuel oil shipments from U. S. from 10 to 2 francs per 100 kilograms. Import duty on shipments from other than U. S. was reduced from 30 to 6 francs.

Wife of Director Of OWIU Publicity To Share Big Estate

By Brown Booth
Special NPN Correspondent

FORT WORTH — Mrs. Jessie Lloyd O'Connor, wife of the publicity director of the Oil Workers International Union here, has joined the capitalist ranks through her share in a million dollar inheritance.

Mrs. O'Connor, whose huband is Harvey O'Connor, will share with four brothers and sisters a portion of the estate of her father, the late William Bross Lloyd, 71, an attorney of Winnetka, Ill., who died in Boston June 30. Mr. O'Connor, besides his OWIU duties, is also Tarrant County director of the CIO Political Action Committee, edits the *International Oil Worker*, and is author of the book "Mellon's Millions."

Mrs. O'Connor said that it was not her intention to "waste it by increasing our scale of living or anything like that."

The O'Connor's two children, Stephen Lloyd, 6, and Kathleen Maverick, 4, will also share in the estate. Terms provide that the principal be divided among Mr. Lloyd's grandchildren but bequeathed the widow, Mrs. Madge Bird Lloyd, a life interest in homes in Winnetka and Weston, Mass., and in one-third of the estate's income.

The remainder of the estate's income will go to five children, who are Mrs. O'Connor, William Bross Jr. and Mary Maverick Lloyd of Winnetka; Mrs. Georgia Berndt of Chicago, and Dr. John Birch Lloyd, an interne at Brigham Young Hospital in Boston.

The O'Connors came to Fort Worth about 18 months ago from Chicago. Mrs. O'Connor is a graduate of Smith College and is a former correspondent in Moscow and Geneva for the London Daily Herald. She has been interested in peace and labor movements for some years. She also plays the violin.

Her mother, Mrs. Lola Maverick Lloyd, died in 1944. In 1937 she was chairman of the Campaign for World Government, and with Jane Addams and others was a founder of the Women's International League for Peace and Freedom at The Hague in 1915. She was a descendant of Samuel Augustus Maverick of the famous Maverick family of Texas and was a first cousin of Maury Maverick, former liberal congressman from San Antonio.

Parley on Illinois Rate Cut For Oil Shipments Is Set

NPN News Bureau

CHICAGO—Conference subcommittee of Western Trunk Lines Traffic Executive Committee will meet here during week of Aug. 18 (exact date not yet fixed) to consider reduction of rates on shipments of petroleum and products in Illinois.

Proposal for reduction is known as WTL Application 37-821, which had approval of WTL freight traffic managers on July 12. It would make substantial reduction in rates from Chicago, Gary, Whiting and other district points; from St. Louis, Wood River, also from Robinson, St. Elmo and other producing districts to given destinations taking the same rate in WTL territory.

Representatives of southwestern lines are expected to attend the conference as inland refiners in Oklahoma and Texas say approval of the rates would disturb rate relationship with that territory.

Mexican Area Opened for Private Oil Exploration

MEXICO CITY — The government of Mexico last week called for bids for private oil exploration for the first time since 1938, when the government expropriated most foreign oil properties.

The bid call, for 75,000 acres in Sinaloa, is open to foreign as well as to Mexican commercial companies on a 12.5% royalty basis. The government reserves the right to review any contracts and to take half of the zone for a government petroleum reserve if extensive deposits are found.

A bidder must agree to drill at least three wells in the first three years and must put up a guarantee of 10% of the cost of the three wells.

New Economics, and Statistics Department Set up by Shell Oil

NPN News Bureau

NEW YORK—Shell Oil Co., Inc., has established a new economics and statistics department, headed by J. G. Campbell.

New department will keep informed of economic factors affecting company's business and will conduct both general and specific research in the field of economics for management's guidance. It also will correlate, analyze and interpret statistical, financial and operating reports and data of the various operating departments, to keep informed of the trend of company's business, and advise and assist other departments in company on economic and statistical matters.

Mr. Campbell

Mr. Campbell, a native of Hagerstown, Md., graduated from Amherst College in 1930 and for five years was manager of the statistical department of Joseph Walker and Sons, investment firm. He joined Shell in 1941.

Assigned first to statistical work in marketing with Shell, he then held successive positions as secretary of the crude oil supply committee and employment representative for college graduates.

In 1944, granted temporary leave of absence, Mr. Campbell joined the Navy and served 13½ months in the Pacific as deck, division and watch officer.

Antifreeze Supply Continues Critical

NPN News Bureau

CLEVELAND — Anti-freeze supply situation today is more critical than it has been any time, even during the war years. Current supplies of methanol are inadequate due chiefly to the recent coal strike and the fact that limited methanol supply has been cut by allocations to the manufacturers of fertilizer. Also, production of methanol is not sufficient to meet entire demand.

One manufacturer is scheduling production of Type S (methanol) anti-freeze to equal 50% of its total shipments last year. This supply will be allocated on the same basis to customers. Balance of the manufacturer's output will be Type N (mixture of ethyl and isopropyl alcohols). At present the ethyl alcohol is being drawn from government stockpiles which are dwindling since almost no ethyl alcohol is being manufactured for industrial purposes.

Even with normal domestic production, there would not be enough to meet the demand for methanol type antifreezes which at present retail for $1.00 a gallon as compared with $1.40 a gallon for Type N anti-freeze.

Shortage of containers is another factor contributing to the anti-freeze bottleneck. Manufacturers of antifreeze, like oil companies, are searching everywhere for new or used containers that will meet ICC specifications in order to make shipments of what products they have.

Humble Oil & Refining Wins Court Fight on Spacing Rules

Special to NPN

AUSTIN—Humble Oil & Refining Co. has won the latest round of its battle with Texas Railroad Commission over spacing rules in the Hawkins field. Third Court of Civil Appeals overruled a lower court and cancelled a drilling permit issued to C. O. Goldsmith.

Humble is lessee on an adjoining tract and charged that drilling on the tract in question would constitute confiscation of its property.

Readying Final Oil Report

WASHINGTON — Senate Petroleum Resources Committee has been granted permission to file its final report during adjournment of Congress. Committee Counsel Henry Fraser is working on document in his Syracuse, N. Y., office.

Purchasing Agent

"Aiming" for a better steel container

CONTINENTAL makes steel containers in a wide range of sizes and types, for virtually every field of industry. If your product is liquid, solid or semi-solid, there's a Continental steel container to package it. When specifying, remember that the Triple-C identifies the *right* container, backed by complete service facilities.

Right now our production is limited, but we look forward to taking care of your requirements as soon as sufficient materials are available.

A COMPLETE LINE OF STEEL SHIPPING CONTAINERS

The Triple-C means best in quality, service

CONTINENTAL CAN COMPANY

100 East 42nd Street, New York 17, N. Y.

[NO. 6 IN A SERIES]

the proposition

Tower Propane Deasphalting is a required base for the economical production of quality lubes from average feed stocks.

the facts

Commercial operation has proven that the ability of the process to obtain clean-cut separation of oil and asphalt is unaffected by the asphalt content of the feed. This naturally results in superior yields—both in volume and quality. Due to the exceptionally light color of the deasphalted oil only minimum subsequent treatment is required.

The solvent itself—propane—provides several other plus values. *First* it is readily available in most refineries at low cost. *Second*, when subsequent treatment of oil is required—such as dewaxing, acid or clay-treating—the additional processes can be executed in sequence with the propane present. This provides not only installation and operating economy but also appreciably improves efficiency of the subsequent processes.

the conclusion

There is no substitute for the best design.

THE M. W. KELLOGG COMPANY

Engineers and Economists to the Petroleum Refining Industry

225 Broadway, New York 7, N. Y. • Jersey City, N. J. • 609 South Grand Ave., Los Angeles, Calif. • Philtower Building, Tulsa, Okla. • 402 Esperson Building, Houston 2, Texas
Stone House, Bishopsgate, London EC2, Eng.

Only Kellogg Service Has Them All ★

★ **LABORATORIES**—fully equipped and staffed—devoted exclusively to chemical engineering and process development.

★ **24-HOUR-A-DAY PILOT PLANTS**—22 refining processes operating continuously—providing accurate data for commercial scale application.

★ **EXCLUSIVE CHEMICAL ENGINEERING DATA**—Continuously compiled . . . embracing both pilot plant runs and the operation of Kellogg-built refineries. Data extend from beginning of modern refining.

★ **PROCESS ENGINEERS**—Specialists who have continuously made major contributions to oil refining development for more than 20 years.

★ **MECHANICAL ENGINEERS**—Kellogg installations—worth hundreds of millions—are their best reference.

★ **METALLURGICAL LABORATORY**—Establishes continuous check of specifications . . . creates new techniques for the fabrication of refining equipment.

★ **PERMANENT CONSTRUCTION CREWS**—Geared to function all over the world on single units or multiphase refineries . . . team-experience cuts costs, speeds construction.

★ **OPERATING STAFFS**—Specialists at placing new units "on stream" . . . training of refiner's own operating crews.

★ **LICENSING SERVICE**—Licenses available through Kellogg as Licensor or Licensing agent for all types of refining processes.

★ **ECONOMICS CONSULTATION**—Extended experience in the field of refinery economics enables Kellogg to give authoritative counsel in the petroleum field.

Renewal of Battle for Gallonage Emphasizes Need For Stressing That Profits Are Most Important

THESE are days when the oil industry might well study how to make every one in a managing capacity, yes and many other employes too, acutely profit conscious.

For five years up to this month oil, as well as all industries, has had little cause for planning profits. Price ceilings and rationing made profits hard to get for oil marketers, while heavy taxes took them away quickly if one were so fortunate as to make profits. The consequence has been that one has heard few speeches at conventions about how to get profits and only lamentations on the restrictions on freedom for profit generally.

But now, with ceilings gone on petroleum products, and we hope for good, with a plentiful supply that even is starting to press on the markets, we begin to hear the old cry of "get the gallonage." Salesmanship has gotten pretty rusty these war years. Some men are on the sales and even managing job who never have had any sales let alone profit training. The fight for gallonage is on and, if our surpluses continue to rise, that fight will get keener and as it does more and more people will probably forget that they should figure their profit first and gallonage afterward.

So before it is too late every one might well start talking and planning on how to make sure profits. That could well be a big topic on every oil association program, yes even on the marketing program of the API this Fall. We say "profits", not prices or margins. To talk profits and plan for them is entirely legal though the getting of them by others has been severely frowned upon by the do-gooders these last dozen years. Our business administration schools, even Harvard's where other departments seem to turn out opponents of profits, all exist chiefly to teach the prospective businessman how to make profits. So it should be possible for even oil associations to discuss how to make profits at their meetings without being sent to jail by an administration which has been working so hard trying to keep business from making profits.

This subject is proposed for present discussion by A. L. Edsell, oil jobber with the Edsell Oil Co., at Neosho, Mo. His letter is below on this page. He reports particularly that the pressure is now on for gallonage and that major oil companies are splitting special discounts to dealers with their agents and getting very generous as to whom they call a "tank car buyer" or "oil jobber." Major company representatives are reported to be vigorously urging their jobbers and agents to get after gallonage hard and to meet fire with fire.

The oil industry's thinking has always been more of gallonage than of profit. That has come about quite naturally be-

Calls for the Profit Motive

Edsell Oil Company,
1114 Commercial street
Neosho, Mo.
July 22, 1946

To the Editor:

May I propose for your consideration a subject for editorial treatment which is especially close to the thousands of agents, consignees, distributors, jobbers, retailers—yes and majors and Independent refiners and marketers, as close as can be.

I have the idea you could accomplish more with a strong editorial policy on the subject than any single marketer or group within the industry could ever do, and here is the idea,—

While there are no statistics available that I know about, you have seen literally hundreds of individuals fail and falter over the years almost entirely because they lacked the knowledge, ability, courage or something to develop for themselves a fair "price realization."

Agents, consignees, jobbers and retailers may commence with, let's call it a reasonable price margin—but unfortunately the great majority, promptly and almost invariably give so much of it away that they have a most difficult time staying in business.

To make bad matters worse, most supplying company's field representatives quite frankly aid and foster the idea of "meet the so-and-so," and "don't let him take your business", "let's upset some of his accounts" and "make him like it", etc. etc. One large marketer I personally know about, and I suspect there are others, actually designs and prints forms which contract the agent or consignee to pay whatever discount or rebate the agent decides to allow. It is a fact that most refiners' marketing organizations bank on their representatives giving away a large part of their commission and in many instances they contribute a part provided the agent also gives a part of the discount.

Few if any marketers have any idea—maybe they don't care—whether or not their agent, consignee, jobber, etc., make a dollar. The man really behind the tank wagon and pump either knows little or cares little about making money as all his supplier ever talks to him about is "gallonage," never "profit."

NPN is a tremendous factor for good within the industry. You personally and your representatives spend a lot of time and money fostering the economical development of many phases of gasoline and oil marketing and you have done a lot of good by passing on many, many sound ideas, but this matter of price realization seems to me to have been shunted aside or probably for some reason has never been put to the front.

Edsell Oil Company
By A. L. Edsell.

Editor's note—Thanks Mr. Edsell. We take up the campaign in the editorial above and assure you we will keep it up indefinitely. The war has blotted study of profits from too many minds. The industry needs to plan for profits more than for gallonage. WCP.

cause of the relatively high ratio of fixed investment and expense in all industry operations. The larger the divisor the less that cost per gallon became. A 10 bbl. well and a 10,000 bbl. well cost the same to drill but the profit of the larger is tremendous The same has obtained in refining and also in marketing. But as the 10,000 bbl. wells pushed their products through the crude, refinery tank car and finally the retail markets they often displaced competitors so that the low cost advantage of large gallonage was used to cut prices and the gallonage was thus achieved regardless of consequences to the industry.

Then the oil business has been dominated by the thinking of the large companies, the bulk of whose management is far away from today's profit, in fact most managers seldom if ever know what their daily decisions are doing in profits or losses. As none of the larger integrated oil companies that we know of have ever published even to their employes, profits, or losses, by departments, there has not been the knowledge or profit rivalry for their discussion. But every one knows the gallonage figures and the gasoline taxes make possible every one knowing his competitors' figures, so gallonage is the chief subject of conversations and the only measure of success.

Independent oil men, producers, refiners and jobbers and dealers, are far more likely to talk considerably about prices because of the immediate reaction to their pocket books when prices go up or down. Whereas a major company man who is not a proprietor only knows of his company's profit once a year or so and then it is given as an over-all profit and not by departments. A further cause of the major man not being so keenly price conscious is the fact that his salary goes on pretty much the same no matter how the company's profits are and that is true even of the top executives, while the Independent buys a new house in his good years and loosens up considerably on his personal spending. Bad years find him cutting down not only in the business but at home.

The major oil companies could well look into the value and effect of the direct profit incentive among their smaller competitors and they also might look into its effect in the department store business. The retail store is fast moving and highly competitive and well managed. That is due to the store owners working with the profit motive. A big store is divided into several hundred and more departments each run by a buyer with the buyer paid only on the profit and loss of his own department. An invested capital account is kept for each buyer and he is charged with all expenses including rental of display windows. Each day's sales are carried on a rough profit and loss basis, with a carefully figured one promptly at the end of each month. The buyer therefore has the same interest in making a profit in his department as the owner of the store has for not only that department but for the entire store.

The more proprietors there are in the oil industry, in big companies and little, the more profit minded the industry would be. One of the big management problems of all big companies is that the employes and department heads and even executives are too far away from the profit and loss. Decisions are made that would not be made if a wrong decision was going to take dollars out of the decision makers' pocket immediately. A type of thinking, such as "get the gallonage", exists that would not be so strong if every man who had to make a gallonage decision was on a profit and loss basis as regards that decision.

Perhaps one advantage of having Independents in the oil industry is that they are important propagandists for profits. Consider, if all persons active in the oil industry were on salaries and none were stockholders? Imagine where "get the gallonage" would lead us.

All groups in the industry, especially in refinery sales and marketing where profit decisions are made many times an hour, could well study ways of spreading more profit propaganda. Perhaps a way could be found to convert the majors to institute some form of management and compensation for all profit-and-loss-decision managers, that would bring to those majors some of the values to be found in proprietorship management.

The immediate step would be to put "profit" speakers on all oil meeting programs.

READERS' comments and opinions will be much appreciated by Warren C. Platt, NPN's Editor and Publisher, Penton Building, Cleveland 13, Ohio.

Petroleum Division of ACS To Celebrate 25th Year

NPN News Bureau

NEW YORK — The 25th anniversary of the American Chemical Society's Petroleum Division will be celebrated at Chicago during week of Sept. 9. Over 1,000 chemists from oil industry laboratories and technical schools are expected to take part.

Celebration will take place during the 110th national meeting of the society. Dr. Stewart S. Kurtz, Jr., Norwood, Pa., Sun Oil Co., chairman of the division, reports that numerous addresses dealing with problems of the oil industry will be delivered at the sessions. Bruck K. Brown, Chicago, general manager of research and development of Standard Oil Co. of Ind., will speak on "Petroleum from 1921 to 1971" at a dinner on the evening of Sept. 10.

Dr. Charles L. Thomas, research director of the Great Lakes Carbon Co., Chicago, is vice chairman of the division and is directing arrangements for the celebration. The Petroleum Division is the largest of the Society's 18 professional divisions. It numbers 1,300 members.

Farm Motor Trucks, Tractors Show 5-Year Gain of 1,200,000

NPN News Bureau

WASHINGTON — There were more than 400,000 more motor trucks and 850,000 more tractors on the nation's farms in 1945 than in 1940, Commerce Department reports in Agricultural Census for 1945.

Last year about one farm in five reported one or more trucks in operation and one farm in three reported one or more tractors, the department stated. However, one farm in four had no tractor, horse or mule.

Department reported the nation's farms had a total of 2,400,000 tractors during 1945, compared with about 1,600,000 in 1945.

Star Oil Purchases 24 Wells In Texas for $2,500,000

Special to NPN

HOUSTON—Raymond I. Arsht, president of Star Oil Co. of Houston, has confirmed the purchase of 24 producing wells in Starr County from Lockhart and Company. Consideration was $2,500,000.

The 24 wells, with a combined production of 1000 b/d, are in the North Rincon, Cameron, Ross and Lockhart fields. The Star Co. immediately announced plans to drill 10 new tests in the above fields.

Tank Truck Trailer Output Up

NPN News Bureau

WASHINGTON—April production of petroleum tank truck trailers totaled 170 units, compared with 133 in preceding month, Commerce Department revealed this week. April shipments, totaling 158, were valued at $669,099.

U·S·S STEEL DRUMS

When you choose U·S·S Steel Drums, you are getting a product backed by manufacturing facilities, technical skill and production know-how unsurpassed in the industry. Remember also that our lithographing facilities are the most extensive in the field. These assure you the faithful reproduction of the most intricate designs in a wide variety of colors. For all your steel drum requirements—as well as for the solution of any container problem—consult with us. There is no obligation.

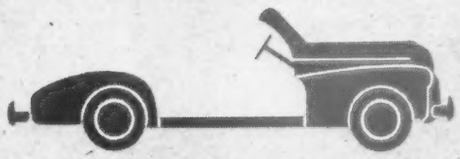
MANUFACTURED FROM USS STEEL UNITED STATES STEEL

UNITED STATES STEEL PRODUCTS COMPANY

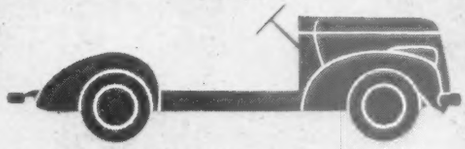
30 Rockefeller Plaza, New York 20, N. Y.

BENNETT MANUFACTURING DIVISION, *Chicago and New Orleans*
BOYLE MANUFACTURING DIVISION, *Los Angeles and Alameda, California*
PETROLEUM IRON WORKS DIVISION, *Sharon, Pa., Beaumont and Port Arthur, Texas*

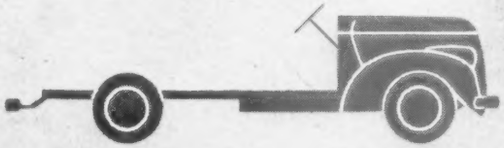
UNITED STATES STEEL



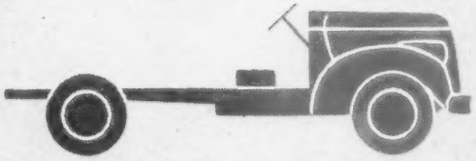
116-inch Wheelbase—One Model



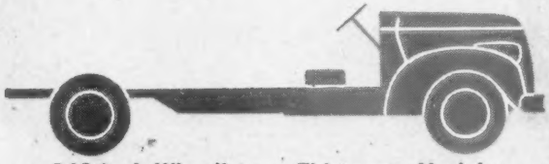
115-inch Wheelbase—Ten Models



125¼-inch Wheelbase—Nine Models



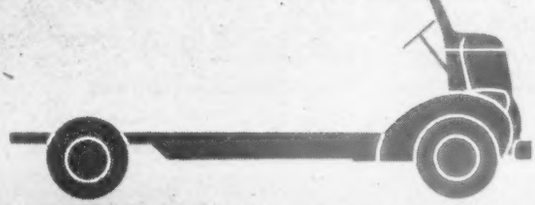
134½-inch Wheelbase—Thirty-four Models



160-inch Wheelbase—Thirty-one Models

109-inch Wheelbase—Four Models

132½-inch Wheelbase—Seven Models



158-inch Wheelbase—Two Models

WHATEVER YOUR BUSINESS THERE'S A CHEVROLET TRUCK TO FIT YOUR HAULING NEEDS

99 MODELS
9 WHEELBASES

195-inch Wheelbase—One Model (School Bus)

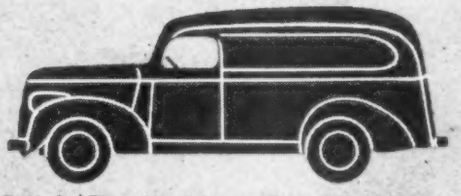
CHEVROLET

The only business that can't profitably use a Chevrolet truck is a business that needs no truck at all—for Chevrolet's expanded line, which now comprises 99 models on nine wheelbases, ranges from the beautifully styled Sedan Delivery to ruggedly massive models in the heavy-duty class. Newly added to the truck line are heavy-duty models of increased load capacity. . . . Among Chevrolet's 99 models on nine wheelbases—some with the standard Thrift-Master engine, some with the high-torque Load-Master engine—there is a truck to fit *your* requirements. . . . Whether you use a standard type of body, a special-purpose body, or specialized mechanical equipment, there is a Chevrolet to serve your needs and save you money.

CHEVROLET MOTOR DIVISION
General Motors Corporation
DETROIT 2, MICHIGAN

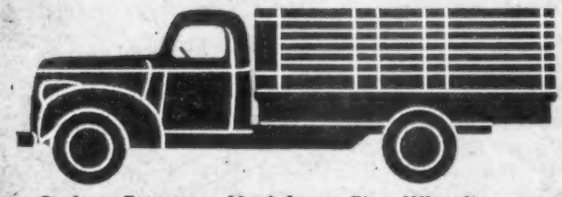
SEE YOUR CHEVROLET DEALER
HE CAN SUPPLY SPECIAL BODIES AND EQUIPMENT FOR ANY HAULING JOB

Pick-up—Four Models on Three Wheelbases



Panel—Five Models on Four Wheelbases

Canopy Express—Three Models on Two Wheelbases



Stake—Fourteen Models on Five Wheelbases

High Rack—Four Models on Two Wheelbases

CHEVROLET TRUCKS

PICK-UPS PANELS STAKES CAB-OVER-ENGINE TRACTOR-TRUCKS AND CHASSIS FOR SPECIAL EQUIPMENT

99 MODELS • 9 WHEELBASES • THE RIGHT TRUCKS FOR ALL TRADES

Oil Men Weigh War Supply Experiences, Act to Prepare Industry for Any Eventuality

Colonel Cummings Heads Organization of Ex-POL Men To Study Military and Industry Changes

Oil men have begun detailed plans on how to do a still better job of supplying petroleum products to the armed forces in the next war, if there is another war.

This first planning is by regional committees of the oil men who helped bring petroleum from the refineries of the world to the war theaters and up to the front lines of fighting armies, air forces and navies in this past war.

The planning is to be based on the observations and experiences of these men in all war theaters as well as in all supply areas. Recommendations of possible changes and improvements in military oil supply methods will be made to the Army-Navy Petroleum Board, which in turn will make recommendations to the Joint Chiefs of Staff. This planning was proposed by the several hundred oil men who had served in all the armed forces and who attended the recent seminar held at Washington by A-NPB, under which these men had carried on their oil work.

Carl E. Cummings of the Texas Co., who was a colonel in the oil supply work for the Army and at the end of the war was chief of the Area Petroleum Office at London, England, is chairman of the general committee in charge of this survey. He hopes to have every oil man who served in any of the POL services (Petrol, Oil & Lubricants) participate in this study, as fast as he can get their names and present addresses.

Parallel with this study of the war's oil supply problems is the study and organizing of oil men for an oil reserve corps, and how best can this corps be created with a continuing enlistment of the oil industry's skilled men. This project also was authorized at the seminar of POL men held by A-NPB. Former Lt. Col. W. T. Leeper, vice president in charge of sales of Bayou State Oil Corp., Shreveport, La., and late of the air corps ground forces in Europe, was made chairman of the committee of oil men to get a plan and names for bringing this reserve corps about. Details of Colonel Leeper's job and his plans will be given in next week's NPN.

This work by these ex-military oil men is a part of the plans of the top military authorities to organize the entire oil industry, as well as all other war essential industries, against the possibility of future world trouble. While plans against future wars have always been made by the military after every past war they have mostly fallen by the wayside for lack of public interest because the public considered this country safely protected by two big oceans and air power never loomed menacingly in the public mind.

But almost every one these days knows that the next war, if there is one, will strike this country from the air, by flying bombs and fleets of planes dropping bombs over the United States from coast to coast. Such a war probably would come with little if any notice. Bombs and planes would spread over this country by the tens of thousands in the first 24 hours of war and probably every 24 hours thereafter, creating far more havoc than the 125 aerial bombs, the maximum that reached London in a 24-hour period in June and July of 1944. Even these daily 125 did great damage to London and southern England.

Any war in the next 15 to 25 years, and whatever defense may be devised against it, would be based on the internal combustion engine, or the turbine or jet engines. But whatever the type of engine, it will be fueled and lubricated by the products of what we now know as the oil industry. Since oil in this past war powered everything that moved, on sea, and land and in the air and constituted half the ocean tonnage of war munitions shipped overseas, the military authorities are giving special attention to oil as a basic war industry. There is no intention to "run the oil industry" or dictate to it as to its peacetime operations but the military authorities are following up on the hearty co-operation they were given by the industry in World Wars I and II, to work out plans for their still closer co-operation. The same is true with the automotive, airplane and manufacturing industries.

While the military have made no formal announcements sufficient has been said publicly to warrant the oil industry concluding that, as plans develop, the industry will be invited into closer co-operation with the military than ever before. That would be a co-operation which would include putting much oil storage underground against attacks from the skies, a standardization of handling equipment, including trucks, so that civilian facilities could be instantly called upon by the military, and some measure of protection for oil refineries where the fuel and lubes for the country's defense and winning of a war must originate regardless of the extent of any enemy attack.

Training for Military Officers

For this greater co-operation with the oil industry the A-NPB has had assigned a fair sized group of young officers from Annapolis and West Point to work and study in various oil refineries and to take the courses in petroleum engineering that several colleges offer. The aim is not to make expert oil men of these officers but, by rotation of officers of our regular peace-time Army, the top military will have in all services men who understand the problems of petroleum and of the equipment that uses it in Army and Navy so that they will be better able to plan the best use with a full understanding of what can be done to supply the necessary fuel and lubricants.

For instance with regular Army officers so trained, oil men will not have to argue in future wars about the efficacy of pipelines over truck transport, that temporary pipelines, such as were used in Europe, carried their own weight every 1.9 days, hence they made a great saving of trucks and allowed still more non-pipeline traffic on the already crowded roads. These regular Army officers now being trained in the oil industry, will the more quickly provide trucks for moving pipeline equipment, which some of their illustrious predecessors would not always do.

New ideas the military may develop on oil storage and handling. Present POL military men know that the demand for fuels and lubricants will be tremendous and they are challenging their newly recruited oil officers and the men of the oil industry to let their imaginations go to the skies. A rough outline of some possible ideas for the Army to adopt, prepared by the Fuels & Lubricants Branch of the Quartermaster Corps, reads as if Jules Verne had cooked it up while spinning out his famous "Twenty Thousand Leagues Under the Sea." The planners of fuel handling for tomorrow's wars are urged to think of flexible glass pipelines, for

Continued on Page 30

Col. Cummings...

An Ex-Army Oil Man Looks to the Future

Carl E. Cummings, former POL colonel and now with The Texas Co., heads committee for the organization of an oil industry reserve corps

This is the story of an oil man who served long and well in POL in this country and overseas, and who now heads up one of the committees to canvass ex-POL men as to their views on improving the military set-up and methods for handling petroleum products (see p. 28). This story was scheduled to have been written back in London in the summer of 1944 but the subject stalled by promising to mail data not only of himself but of the job he was then doing. The data never arrived and promises since then have proved worthless.

But here it is at last with a picture that I did succeed in having taken in London.

The subject is Col. Carl E. Cummings but he most definitely dropped the "colonel" when he took off his uniform last August, 1945. He is back at the big research laboratory of The Texas Co. at Beacon, N. Y., a lab that he helped plan and build as chief engineer in 1931. He is now superintendent of it with close to a thousand men under his charge.

Mr. Cummings' last job with the Army was as chief Petroleum Officer in charge of the Area Petroleum Office, London, England. Here he succeeded Col. E. F. Barnes, a regular Army officer who, near the end of the war, was assigned to other duties. Mr. Cummings wound up the war and the affairs of the office there. Mr. Cummings went to London in 1943 as a lieutenant colonel to coordinate technical activities for the Army-Navy Petroleum Board. From this work he was made deputy to Colonel Barnes and in 1944 was made a full colonel.

The London Area Petroleum Office had much to do with the invasion planning for France, while Mr. Cummings was there, as well as helping to coordinate the supplies for the Continent during the rest of the war and to work with the British whose large facilities in England, were used by the American forces. Civilian Supplies under lend-lease for both the United Kingdom and the Continent also came under the London Office. Mr. Cummings was frequently flying about England and to the Continent. He was in London for a touch of the "blitz" in 1943 and got the full dose of flying bombs both in the early summer of 1944 when they were quite bad and again when they started up still worse in the winter of 1944-45. While walking across Hyde Park to his office one morning a blast from a nearby V-2 knocked him to the ground.

Mr. Cummings' military experience for years prior to the war had to do with working with the Army on fuel and lubrication problems. The Army contact started at Northwestern University where he was in the cadet corps. He graduated from Johns Hopkins in mechanical engineering in 1923 and took a commission as a second lieutenant in the officers reserve. Prior to that at Baltimore Polytechnic Institute he worked on engine testing for the U. S. Engineers. Mr. Cummings' father had been an engineer in the U. S. War Department in years past also.

At Johns Hopkins Carl Cummings worked on lubrication problems, did summer work on them for The Texas Co. and went with that company permanently on his graduation. He started the company's first engine lab in a hay loft over an old stable at the Long Island bulk plant and represented the company at the first Co-operative Fuel Research road test in 1922. He worked in the engineering department at Bayonne and directed the laboratory work on various refining and product problems. Then the Beacon lab was started.

Mr. Cummings was called to active Army duty as a captain in April, 1941. He was first assigned to the technical staff of Ordnance at Washington and then to the Tank and Automotive Center at Detroit where he worked on the many problems Ordnance had in developing armored tanks, trucks, etc. He helped standardize products for the ground forces, initiated the universal use of heavy duty oil to eliminate supply of different qualities; and converted aircraft-type medium tank engines to use 80 oct. instead of 90 oct. aviation. He was cited for co-operation with the Navy in ventilation design of LST's to permit warm up of tanks before a beach landing. For these and his many other engineering jobs as an oil expert, both in this country and abroad, he was awarded the Bronze Star Medal and the Legion of Merit.

Mr. Cummings has a wife, a boy at Lehigh just back from 2 years in the Navy, and a daughter at college.

Mr. Cummings is one of the many hundreds of the oil industry's top technical men who literally disappeared in war work not only in this country but in all war theaters. Though their work

was hidden behind the curtain of necessary military secrecy, the oil industry should know more about that work now; their individual companies should become informed as to the importance and quality of that work; oil associations and technical societies should inform themselves; all, that they and the industry can give due honor to these men whose work put the oil industry and its products through the war, meeting every demand made upon the industry and its products.

A still more important reason why the industry and the scientific and technical organizations should know more of these men and their work in this past war, is because they, these particular men and their successors in their oil company jobs, will be the oil industry men who will plan and specify the extent, character and location of refineries and the character and specifications of the products they will make. For these men, will be the ones through whom the military authorities will largely work on plans for protecting the U. S. in the event of another war.

As these technical men of oil will have, without questions, such an important influence on the future of the oil industry, it would seem only common sense that there should be working with them a group of the very top oil executives. These technical men will need guidance and support in their contacts with government and they should get this help direct from the industry's top executives and not fourth or fifth hand down the usual line of oil company rank, where they were in the last war. Nor should they have to get this guidance through any National Petroleum Council or other government agency or government bureaucracy. The problems these oil men have to do with cannot be strained through such contacts in order for their recommendations and necessary decisions to reach the top oil executives and with full accuracy and sufficient detail needed for the important decisions that will have to be made.

In the meantime, NPN submits the good work of Colonel Cummings as indicative of the work done by hundreds of other oil technical men.—WCP.

Oil Men Weigh War Supply Experiences

Continued from page 28

instance, run off large reels, and even laid by airplanes. They are urged to plan lighter equipment that will not only carry more cargo but enough fuel for itself to send that equipment 1,000 miles without refueling. These and other ideas may sound fantastic but first class engineers are already at work on them. Their announcement so appealed to the imagination of the oil technician that NPN ran it as the lead story in the July 24 issue of NPN, p. 11.

The executives of the Fuels & Lubes Branch and of A-NPB are keying their thinking to the atomic bomb age, but still aware that any war equipment for many years to come is more likely to be moved with internal combustion or jet type engines than by harnessing exploding atoms to the wheels of a truck.

Visualize for a moment in graphic terms this country's defense problem?

Out of the sky without notice and without sound may come 5,000 to 10,000 or more flying bombs landing all over the U. S. in one day. Germany was making strenuous plans for sending several thousand a day to England alone but our air attacks destroyed many of the assembling and launching depots.

With the bombs would come airplanes by the thousands, dropping other explosives.

The best known defense is to get a lot of planes in the air, to intercept the flying bombs, providing they are the slow moving buzz-bombs and not the high flying V-2s, and to send other planes to destroy the launching depots from which all bombs and planes come. That could mean our putting 50,000 planes in the air at once from a few thousand fields.

These are not large figures when one considers the Air force admits to having something more than 6,000 bombers in the air over Germany at one time. I saw two great groups of fields from each of which as high as 1,700 bombers would fly to Germany in a day, accompanied by half as many fighter escorts.

Keeping Planes in the Air

All of these planes of tomorrow will take tremendous quantities of fuel, no matter how efficient their engines of 10 or 20 years from now. One big group of fields in southern Italy in the spring of 1945 would regularly consume more than 60,000 b/d of aviation gasoline on every good flying day and that time of the year they had many good days. There was also a group of fields in one area in England of similar size. This consumption was so great that these fields could only be kept supplied with fuel by large pipeline systems, with 5,000 and 6,000-gal. refueling trucks being used only on the fields.

Then, in any such defense, we would have a lot of movement of ground forces. An idea of what that might total is the fact that in the final push into Germany the American Army's ground forces alone consumed more than 6,000,000 gals. of motor fuel a day.

You can let your imagination fly as high as you want to and you probably will not over-estimate the demand for fuel and lubes. That is what the men who are pushing this planning think and they got their ideas from being there in person at the heart of the great consuming areas of the war. Col. G. H. Vogel, chief of the Fuels & Lubes Branch of the QM and representing the Army at A-NPB, was boss of all oil supplies on the entire Mediterranean from the start of the invasion of North Africa in the fall of 1943 to the end. Capt. B. B. Biggs, representing the Navy at A-NPB was the chief fueling officer at many points for the Navy and particularly for the biggest fleet in the far Pacific. These men saw planes, and ships and ground forces burn up petroleum faster than man had ever witnessed before. These are the men who are urging the Jules Verne type of thinking to meet tomorrow's war problems on oil supply.

This also is the fantastic picture that the oil men saw as it was painted from day to day by consumption figures being added to their tally sheets. These oil men saw the consumption at the many thousands of air fields—England admits to more than 700 separate fields just prior to the invasion of France for instance. They saw the consumption along the battle lines and in the air. And they had to race up and down hundreds of miles of trucks and armored equipment moving 50 yards apart all the way from seaport—say Cherbourg 300, and 500 miles across the Continent to Germany and Berlin. And they saw the 4000 ships that slipped up to the coast of France and unloaded the greatest invasion of all history.

You who read this, with your employes and your equipment and plants, will soon be enlisted in the defense of the U. S. against another war. If that war comes you will have an important part to play it in, no matter where you are in the broad U. S., for the fuel from the sale of which you make your livelihood and send your children to college, is the fuel that will make that war the most terrible of all wars, and it is the fuel, as managed by you and yours, that will supply the only practical defense, in all probability.

Regional POL Heads

Here is how Colonel Cummings is starting to enlist the efforts of every oil man who was in POL in all services and anywhere in the world. He has asked 11 former POL officers to act as temporary chairmen of as many regions, where the largest number of ex-POL are now living.

These regional heads are:

New York, William R. Boyd, III, former lt. col. air corps in Europe, now with Cities Service Oil interests.

Washington, D. C., E. P. Kavanaugh, former lt. col., assistant director of Theater Division A-NPB, now with the California-Texas Oil Co.

Boston, B. C. Astrup, former lt. col. pipeline and distribution in Europe and back with Shell Oil at Boston.

Houston, R. W. Harrison, former major on construction of the Military Pipe Lines in France and back with Boat-

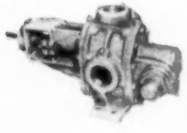
Here's a BETTER way

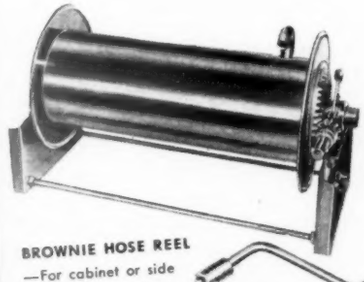
The Brownie Way!

PUMP and METER SYSTEM
WITH THE NEW FLEXIBLE
SHAFT TANK PUMP DRIVE

45 G.P.M. 4-PORT GRANCO pump of unequalled capacity per pound of weight. For 1" driveshafts. Easily installed, eliminating tricky piping.

50 G.P.M. ROPER ROTARY pump with built-in relief valve and ball bearing. All parts readily accessible 2" threaded inlet and outlet.





BROWNIE HOSE REEL —For cabinet or side mounting. New design free-running gear driven wheels. Large bearings, improved type swing joint and positive brake lock.

Adaptable: The Brownie Pump and Meter System, with the new Stow Flexible Shaft, can be installed on tank trucks and trailer tanks as a compact unit, wherever most convenient, for regular inspection, lubrication and attention to packing.

Easy to Install: Any mechanic, with ordinary garage facilities, can install the Brownie Pump and Meter System and the Stow Flexible Shaft. Installation cost is a fraction of that required for any other drive.

Cuts Operation Costs: Your deliveries will be speeded up with a Brownie Pump and Meter System and you will save on maintenance costs, too, because the Stow Flexible Shaft reduces end thrust on power take-off and pump shafts, absorbs shock loads and automatically compensates for chassis distortion caused by uneven roads.

BROWN STEEL TANK COMPANY
2901 4TH STREET S. E. MINNEAPOLIS 14, MINNESOTA

right & Mitchel, Houston, oil construction engineers and contractors.

Philadelphia, George A. Ritchey, former commander in USNR, now with Atlantic Refg. Co., Philadelphia.

New Orleans, Louisiana and Mississippi, Charles B. Gholson, former lt. col. military pipeline group, oil producer and drilling contractor, Jackson, Miss.

San Francisco, Charles R. Johnson, former commander U. S. Navy, now with Shell Oil Co., San Francisco.

Los Angeles, Howard C. Pyle, former major POL staff for Armies in France, oil expert with Bank of America, Los Angeles.

Tulsa, Rex L. Smith, former colonel, Military Pipe Line Group in France and back with Skelly Oil Co., Tulsa, Okla.

Pittsburgh, Alexander W. Gordon, former colonel, aviation petroleum officer and director of Material Hq. 8th Air Force, now with Gulf Oil Corp., Pittsburgh, Pa.

St. Louis-Chicago, Claude L. Marshall, former POL in the Mediterranean and lt. col. in charge of 15th Air Service Command in Italy, back with Shell Oil at Wood River, Ill.

Cleveland, C. E. Spahr, former captain on pipeline construction and in C-B and back with Standard of Ohio, Cleveland.

Each of these chairmen is asked to contact all the ex-POL men in his region. A list of these men has been sent to each chairman from the records of the A-NPB but each chairman is warned that the list is not complete and to use every means possible to get the missing names. Colonel Cummings asks that every ex-POL man of Army, Air Corps or Navy who does not hear from his regional chairman to contact that chairman and also to send his name in to Colonel Cummings, P. O. Box 509, Beacon, N. Y.

Colonel Cummings calls attention of the remarks of Lieutenant General Lutes when he addressed the POL seminar at Washington when he said:

> "In the field of petroleum distribution, war experience has highlighted the necessity for a drastic reorganization of functions in the military services."

Colonel Cummings points out that in the discussion which followed opinion was expressed favoring a consolidation of all work and facilities in connection with the handling of petroleum products in one organization. That would include the building of pipelines and tankage, the filling and handling of cans and tank trucks, the operation of over-the-road tank trucks and the management of all terminals and testing. He calls attention to the fact that these functions today are scattered not only among a number of services, Quartermaster, Engineers, Signal Corps, Transportation, both Truck and Railroad but under many headquarters. High Army opinion seems pretty much in favor of one POL organization.

Colonel Cummings' group is to gain the experiences of the old POL men as to the kind of an organization that should handle POL from here on. He has sent to all POL men specific questions on details.

Each regional chairman will organize the discussion and have a meeting or several meetings of his regional members where final recommendation will be threshed out and a representative selected to present the findings to a national meeting. The national meeting in turn will deal with the A-NPB. What happens from there on will be later decided, but out of it will come a working organization of oil men wholly within the military services. Supplementing these working military oil men will be a group of top oil executives who may work directly with and as a part of the War Munitions Board organization, the top command of Army Supply Forces, or they may work through the National Petroleum Council now in process of organization under the Interior Department.

While no performance date has been set on this preliminary POL work, A-NPB and Colonel Cummings wants it pushed along as rapidly as possible so that the national meeting can be held in the early fall at any rate.—W.C.P.

Present Law Makes Job-Giver 2nd-Class Citizen—Rucker

The job-giver is a second-class citizen under the present inequitable bargaining laws, says Allen W. Rucker, organizer of the Tool Owners Union with headquarters at 1802 Massachusetts Ave., Lexington 73, Mass.

The purpose of the Tool Owners Union is to restore equal bargaining rights to the 50 million owners of the tools of production and distribution.

"Tool Owners Union," says Mr. Rucker in a statement to business papers, "seeks to restore the incentive for saving and risk investment in order that the expansion of tools will be at a greater rate than the expansion of our population. Only in this way can the national per capita scale of living be lifted and the internal and external strength of the nation safeguarded.

"Through eventual local organization, the union of millions of tool owners, who have invested their savings in the world's most efficient production system, will assert the point of view of ownership to Congress and elected administrative officials. The union is nonpartisan. It seeks merely the redress of inequalities in the law that favor one class of citizens—no matter which—as against other classes, so that owners of property invested in production may not be deprived of their property or its earnings by force or arbitrary decrees of any person or group at any time or place."

Survey Shows Jobbers In Wisconsin Really Active in Home Town

The part played by Wisconsin's 500 Independent oil marketers in the state's business, political and civic activities is revealed in a "Home Town Activities Quiz" just completed by the Wisconsin Petroleum Assn.

An analysis of replies received, which is representative of the entire state, and which gives a composite picture of the Wisconsin Independent jobber shows the power of the jobber individually or collectively in his home town or statewise.

Here is how Mr. Independent Wisconsin Marketer stacks up:

He has lived an average of 30.6 years in his home town. He has served an average of 4.9 years on the County Board; the Villiage Board for eight years; his City Council for 9.4 years; the School Board for 7.1 years. He has taken active part in Community Chest work for 10.2 years.

Mr. Independent of Wisconsin has been distributing petroleum products for 14.97 years. He owns 1.31 bulk plants, each employing 8.14 employes. He owns and operates directly 1.78 service stations. He owns and leases 2.54 more. Average employes in the leased stations are 7.7. Of these employes 5.23% own their own homes.

He has belonged to his oil association for 9.21 years, and belongs to other state trade organizations.

As a group these Independents come from widely diversified industries, and are likewise financially interested in many interests other than oil. Thirty percent of them have other interests, such as the lumber, dairying and so on; 83.4% of the Independents own their own homes; 50% of this is town or city property and 30% farms, ranging from five to 500 acres.

Politically a big percentage of the Independents hold city and county posts of various kinds. One of the members is serving in the state legislature.

Of those reporting on war service records, over 100 reported their sons, daughters, brothers or sisters serving in World War II; 301 employes entered service; 12 of them were killed in action; 160 have returned to their former places of business, either in their former capacity or with a promotion.

In summing up the results of the survey, K. C. King, executive secretary of Wisconsin Petroleum Assn. points out that there seems to be no phase of civic or public life which at some time or other has not been represented by a Wisconsin Independent jobber.

"No matter how large or small the community," Mr. King said, "the connections and activities of these jobbers definitely prove them to be the backbone of their communities."

One Grease That Does The Work of 4!

Bat's New 4-in-1 Barium Grease

—an ALL PURPOSE Automotive Lubricant developed after Exhaustive Service Tests in the Field over a Long Period under All Climatic Conditions.

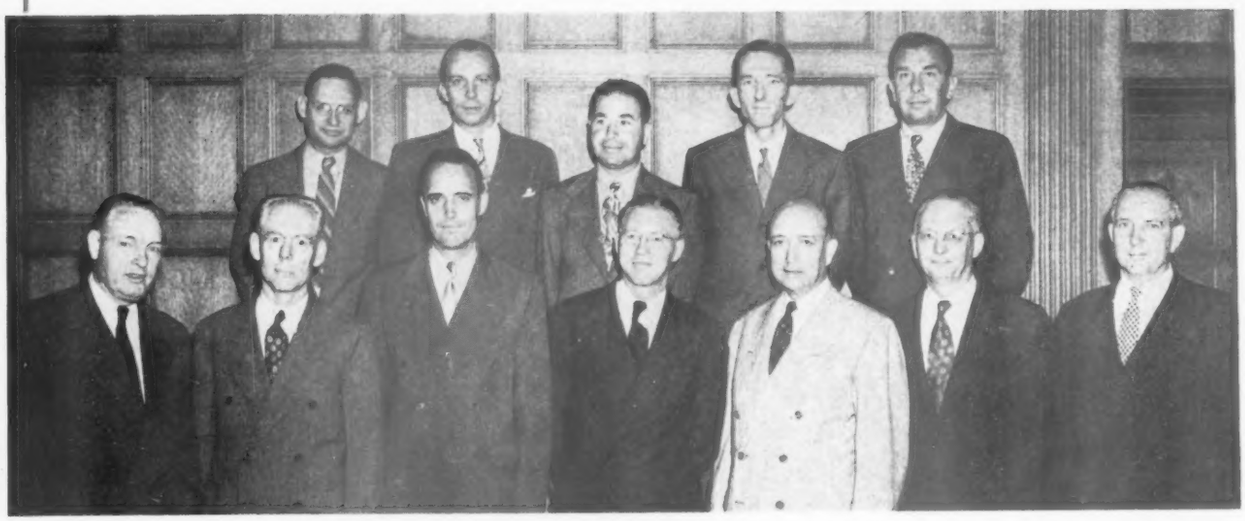
One container instead of four, saving floor space . . . one grease gun instead of four, reducing equipment cost . . . *one grease* for chassis, wheels, universal joint and water pump instead of four or more different greases, reducing stock inventory—that is Bat's *new* 4-in-1 Barium Grease! Now, no essential part can be lubricated with the wrong grease. Investigate this revolutionary new automotive lubricant today!

BATTENFELD Grease & Oil Corp.

"Business is Ingreasing"

Minneapolis, Minn. Kansas City, Mo. North Tonawanda, N. Y.

Kibre Named California Natural Gasoline Assn. President



Top row, left to right: D. B. Johns, vice chairman, Technical Committee; P. W. Mettling, chairman, Entertainment Committee; M. W. Kibre, president and chairman, Executive Committee; L. Harmon Peahl, secretary, Taft Chapter; F. J. Colton, vice president and chairman Advisory Committee; lower row, left to right: R. S. Tulin, chairman, Gas Report Committee; C. D. Gard, chairman, Finance and Budget Committee; L. E. Woodruff, chairman, Program Committee; J. B. Taylor, chairman, By-Laws Revisions Committee; E. G. Ragatz, chairman, Fall Meeting Committee; E. P. Valby, chairman, Technical Committee; M. L. Arnold, chairman, Publicity Committee. E. L. Brock, chairman, Membership Committee, was not present at the time this photo was taken

Special to NPN

LOS ANGELES—M. W. Kibre, General Petroleum Corp., was elected president of California Natural Gasoline Assn. July 9 at annual meeting of board of directors held here at Biltmore Hotel. Mr. Kibre succeeds M. L. Arnold, Richfield Oil Corp.

Following new members were named to board of directors: Coles B. Bason, Ingersoll-Rand Co.; H. L. Eggleston, General Petroleum Corp., C. L. Hutchings, Tide Water Associated Oil Co., and R. C. Patterson, Belridge Oil Co. George F. Howells, Tide Water Associated Oil Co. and chairman of Taft Chapter of association also is a new director.

George L. Tyler was reappointed secretary-treasurer and is now serving his ninth year in that capacity.

Reviewing affairs of the association for the past fiscal year, it was reported that membership has increased steadily and work of technical committees has continued throughout the war period which has resulted in a number of revisions and new bulletins which soon will be released.

Also, association has expanded its monthly report on natural gasoline and cycling plant operations, natural gasoline and LPG production data, and natural gas production and disposition information.

Association continues to co-operate actively with other technical groups of the country and has just recently received confirmation of E. P. Valby, Technical Committee chairman, as CNGA representative on ASTM Technical Committee H on Light Hydrocarbons.

Annual fall meeting of association is scheduled for Oct. 11 at Ambassador Hotel here. General chairman of the event is E. G. Ragatz, Bectel Bros. & McCone Co.

M. L. Arnold, retiring president, California Natural Gasoline Association, presenting gavel to M. W. Kibre, incoming president, at annual directors' meeting, Biltmore Hotel, Los Angeles, July 9

How to Simplify any Oil Piping Job

A lot of oil people know how it's done—have profited by it for a long time. They know the time and trouble it saves on any piping job—from plan to installation—by having Crane supply all the valves and fittings, pipe, fabricated piping, and all accessories as well.

For a bulk plant, for example, or a marine terminal, tank farm or filling station, look what this means. There's a 3-way advantage in standardizing on Crane piping equipment.

—Specifying and buying are simplified because you choose from the world's most complete line of brass, iron, and steel materials for all applications. One order to your Crane Branch or Wholesaler covers everything.

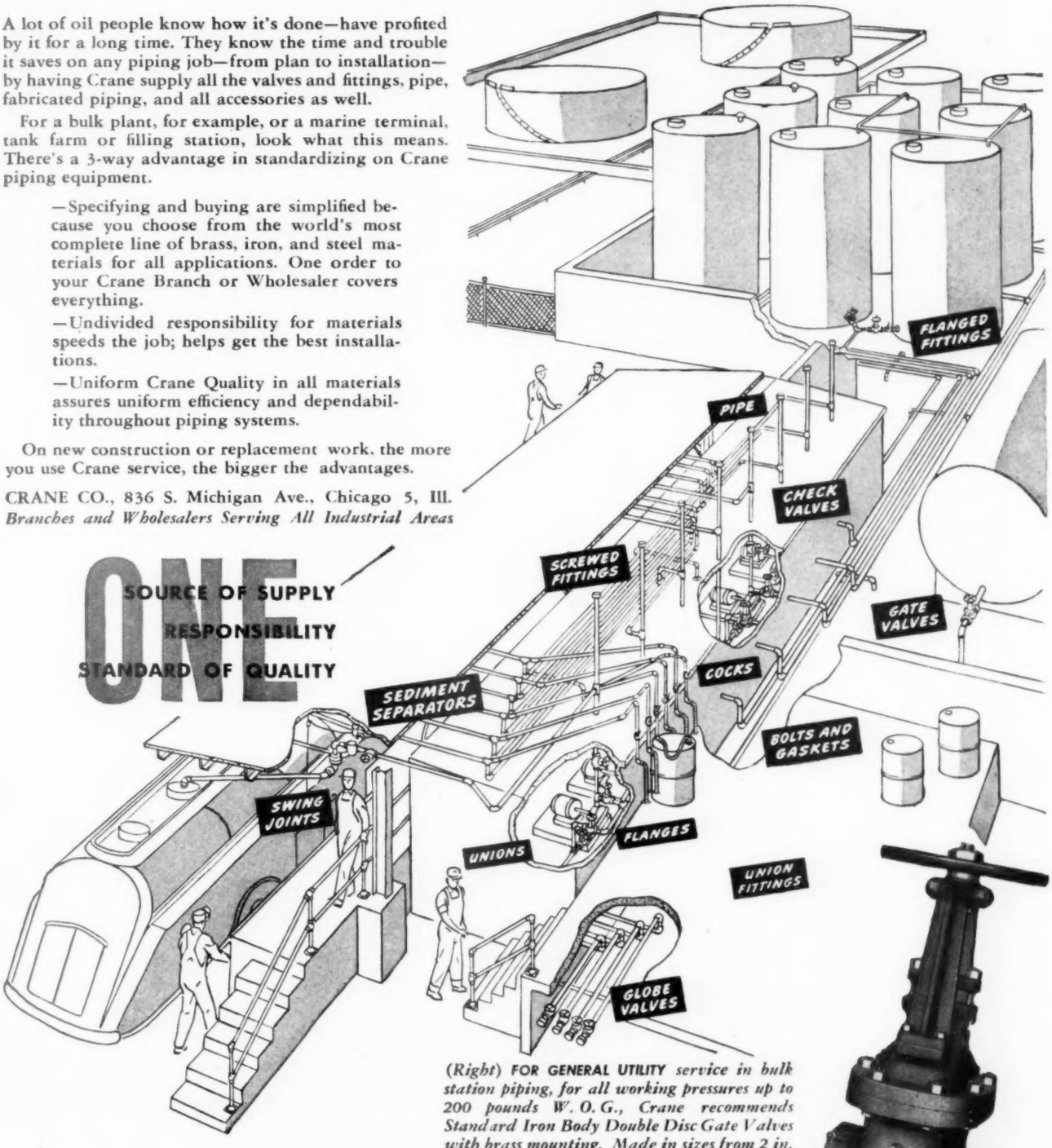
—Undivided responsibility for materials speeds the job; helps get the best installations.

—Uniform Crane Quality in all materials assures uniform efficiency and dependability throughout piping systems.

On new construction or replacement work, the more you use Crane service, the bigger the advantages.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

ONE
SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY



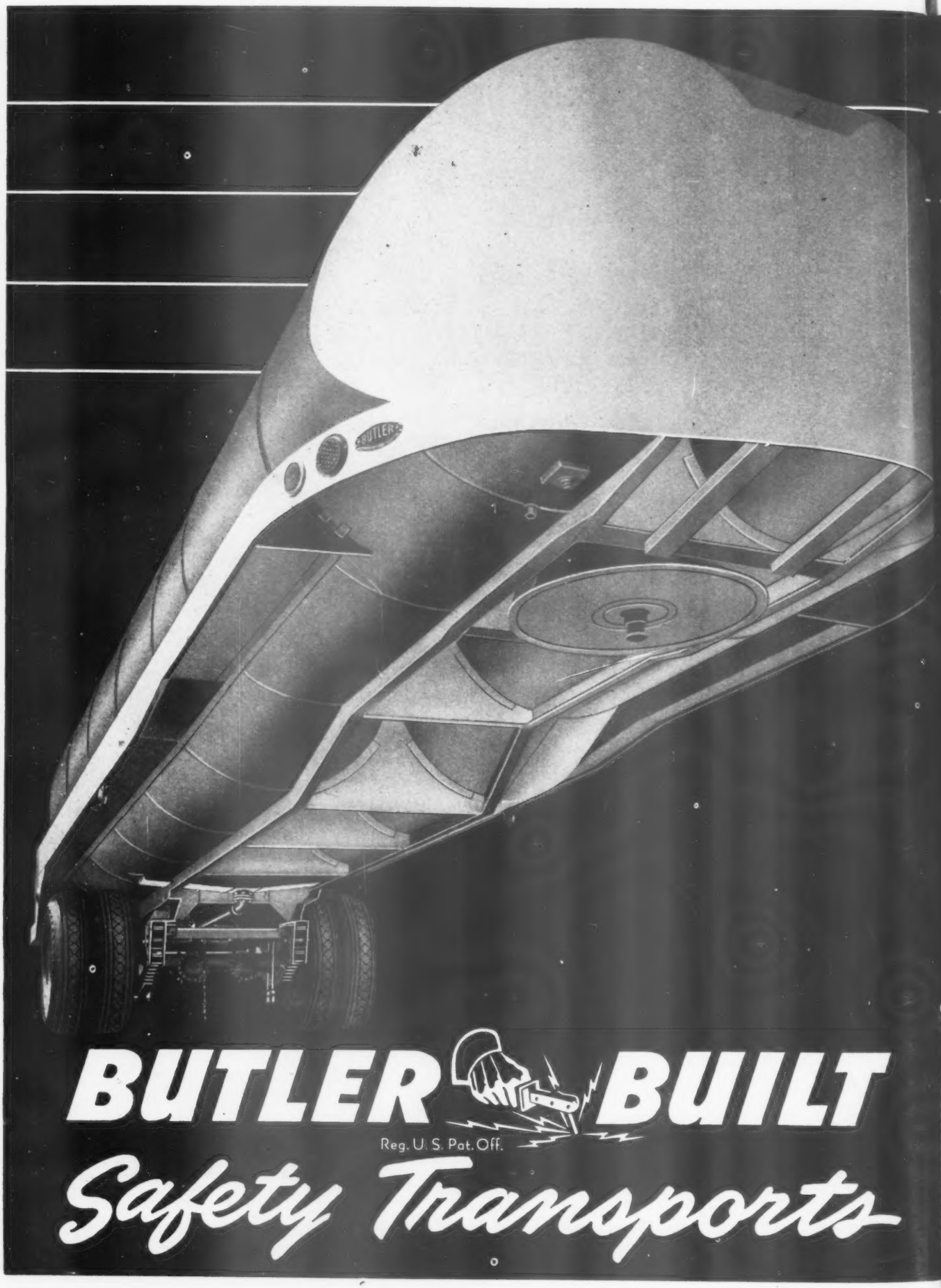
(Right) **FOR GENERAL UTILITY** *service in bulk station piping, for all working pressures up to 200 pounds W. O. G., Crane recommends Standard Iron Body Double Disc Gate Valves with brass mounting. Made in sizes from 2 in. up; in patterns to fit specific needs. See your Crane Catalog, pages 128 and 129.*

. . . EVERYTHING FROM

VALVES • FITTINGS
PIPE • PLUMBING
HEATING • PUMPS

CRANE

FOR EVERY PIPING SYSTEM


BUTLER
BUTLER BUILT
Reg. U. S. Pat. Off.
Safety Transports

FREEDOM FROM LEAKAGE RECORD CAUSES BIG TRANSPORT OPERATOR TO SWITCH TO BUTLER

Recently a contract operator of eighty transport units *BOUGHT* ten Butler Transports.

Since none of his previous units were Butlers, we asked him his reasons for switching.

Main reason was LEAKAGE, of which he had a considerable amount. After making inquiry of other transporters throughout the East he was impressed with the freedom from leakage enjoyed by owners of Butler Transports. To him, as it is to most operators, freedom from leakage, repairs and down-time is far more profitable than trying to carry the last gallon of pay load.

Butler Transports are designed and constructed to carry the very maximum pay load per pound of steel without compromising with strength, safety and endurance factors.

SEND TODAY

BUTLER MANUFACTURING COMPANY

Factories: Kansas City, Galesburg, Minneapolis

Address Inquiries to 7454 East 13th St., Kansas City 3, Mo., or 954 Sixth Ave. S. E., Minneapolis 14, Minn.

Send information on Butler Safety Transports, viz:

Single Axle Capacity_____Gals. Tandem Axle Capacity_____Gals. Transport Train Capacity_____Gals.

Firm Name_____ By _____

Address _____

City_____ Zone_____ State_____

NOW! NEW! Freedom from Odor!

Here's why New Super-Strength, Super-Safe Super Pyro means New Super-Sales and Profits for You!

Super Pyro's new chemical formula packs *extra* anti-freeze protection into every drop! *Gives new freedom from odor!* Plus strongest anti-rust defense! In a new super-quality purple and gold package! Backed by new powerful national magazine advertising in color! Plus new "tested readership" local newspaper advertising! Plus new attention-getting outdoor posters! Be on the safe side and get your order in now for new Super-Safe SUPER PYRO!

U. S. INDUSTRIAL CHEMICALS, INC.

The New SUPER-SAFE SUPER PYRO

Management Service for Dealers . . .

Oil Marketer Representative Looks Ahead, Prods Operators into Preparing for Keener Competition

By FRANK C. STURTEVANT
NPN Staff Writer

Oil company marketing officials conduct what amounts to a management service for small business. Advance planning and thinking for most of the country's 250,000 service stations is provided by executives of major oil companies and oil jobbers. Their sales representatives carry management assistance direct to the dealers in the field.

A prime sample of thinking ahead for the dealer is exemplified by P. E. Lakin, vice president in charge of marketing for Shell Oil Co., Inc. Writing in *Shell Progress* he tells dealers to get ready for some drastic revisions in the economics of the service station business.

Among other things, speaking of merchandise, he says: "A diversified line of merchandise will continue to be a good source of revenue for a service station; but as new goods come on the market for distribution through all sorts of channels . . . they will no longer sell automatically just by virtue of being on sale; there will be more sellers for every customer."

Demand for tires, batteries, and replacement parts will diminish, Mr. Lakin warns, as new cars gradually appear. For what remains of the market, there will be new competition. It will spring up from auto dealers, auto repair shops, and from new or reopened service stations, many staffed by returned veterans.

Longer Hours Urged

The return of competition has been on the minds of oil marketers and jobbers for some time. Shortly after the end of the war most gasoline selling organizations advised their retail outlets to hire some more help and keep open longer hours. Following this came a more or less vigorous drive for cleaner stations, and an all around improvement in station service.

Most dealers have hired more help, and station hours have been lengthened. As a result dealers have been able to handle the rapid increase in volume. The quality of the service offered is not all that was hoped for, when present campaigns were begun, but in most stations it is both faster and better than formerly.

The reason more has not been accomplished is because dealers have been reluctant to spend their own money on such things as additional help, better lighting, more promotion, as a means of meeting competition. During war years profits were made by doing just

P. E. Lakin, Vice President, Marketing, Shell Oil Co., Inc., an oil company executive who believes the time has come for management to help its retail dealers plan for long pull profits

the opposite, and many vainly hoped to continue on the same basis. What could be easier to take than a big volume of business, at no extra expense?

Must Look Ahead for Dealers

But, to quote Mr. Lakin again, dealers don't have to like the law of supply and demand, but it keeps on working just the same. And it is the task of oil company management to look ahead for its dealers, and to advise them that present conditions are too good to last. Eventually there will not be an oversupply of ready customers, money in hand, eager to buy every available tire and battery; there will also be a competitor down the street giving an equally cheerful welcome, and equally willing service; and then automobile merchandise will be on sale everywhere.

An established dealer business is the result of the joint efforts of some dealer, working with the sales representative of some major oil marketer or jobber. However, it is not the aim of sound marketing practice to run the dealer's business for him, but to get him to run his own business. Too often the considerable amount of advise and assistance rendered the dealer, builds in him an unconscious feeling of divided responsibility.

Here is a time when management emphatically should show the dealer the need of providing for his own business future. Of his own volition he should spend money now, and as Mr. Lakin suggests, he should spend it with the same willingness with which he pays premiums for the protection furnished by his life insurance policies.

Spending Time, Effort, Money

Protection for future profits, says Mr. Lakin, just like protection for anything else, calls for expenditure, and in this case not only of money, but of time and effort as well.

Dealer spending to meet competition is just as necessary, Mr. Lakin points out, as investments for the same purpose which management must also make, citing steps already taken by his own company, which: ". . . is not hesitating to employ the necessary number of people to implement its long-range program. More than that, it is investing in courses of training aimed at fitting the right man to the right job."

And he points to the company's advertising budget for 1946 which is the biggest in the company's history, adding: "In other words, we are preparing for increased competition by voluntarily increasing some of the costs of doing business."

By a little management-inspired thought any dealer can study his long-term future, and decide what he needs to do to protect it. An analysis of his operating methods will probably show that he is still coasting on customer indulgence carried over from the war. He may feel customers have been permanently educated down to a less critical level. If so, the marketer sales representative may have to jar him out of it,

Profit Points

This story tells:

1. Why management must supervise dealers, especially now that competition is getting keener.
2. How the marketer representative is a business consultant to the dealer, rather than merely a salesman.
3. Ways management can help dealers build better business.

Sinclair Distributors and Dealers review outline of new merchandising program at "Step Ahead," pre-clinic meeting in Milwaukee, Wisc.

Plans evolved by Sinclair merchandising specialists and Sinclair Distributors now are being crystalized for Distributors, Agents, and Dealers at a series of Sinclair Merchandising Clinics.

At these clinics, motion pictures, slide films, displays, the animated "profit analyzer," and factual surveys are used to help Distributors and their Dealers meet problems of heavy, peace-time competition in the service station business.

Modern methods of merchandising, sales promotion, selling, and business management were exhibited to Distributors at preliminary meetings. Dealer clinics are to follow throughout the fall.

These meetings, to be held in key Dealer areas, will add a new, authoritative plank to Sinclair's post-war platform, which now sponsors Better Products . . . Better Service . . . AND . . . Better Merchandising.

rs to Start HANDISING CLINICS

Phone: Elgin 2577

ELGIN, ILLINOIS

Mr. A. H. Sus, District Manager
Sinclair Refining Company
2540 West Cermak Road
Chicago, Illinois

June 12th 1946

Dear Sir:

Accompanied by management personnel and key dealers, in our territory, the writer recently had the pleasure of attending one of your Meetings announcing Merchandising Clinics for dealers and distributors.

We received a new lease on life, badly needed after four years of excessive wear and tear of war.

We are rounding out our twenty-seventh year as Sinclair Distributors in the Elgin territory, we have rode "the high road" of easy selling, as well as "the low road" of bitter competition during business slumps, depressions and theoretical operation.

We have pinned our faith on the slogan "Forward With Sinclair" quite some time ago, up to this writing have never regretted the act, and are hopefully anticipating the future.

Yours very truly,

Arthur Bunge

Bunge's

"Forward with Sinclair" Says

Arthur Bunge, Bunge's, Sinclair Distributor, Elgin, Ill. Read his letter.

SINCLAIR

SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK

9th & GRAND AVENUE
KANSAS CITY, MO.

2540 W. CERMAK ROAD
CHICAGO, ILL.

573 W. PEACHTREE ST., N.E.
ATLANTA, GA.

307 W. 7th STREET
FORT WORTH, TEXAS

10 WEST 51st STREET
NEW YORK CITY

by recalling for him the prewar days of tough competition.

Then too, if a dealer has already carried out some of the marketer's recommendations about hours and help, he may feel he has done enough to get set for postwar business. The sales representative cannot let the dealer take that view, though it is usually foreign to a salesman's nature to dwell on future troubles, or paint a pessimistic picture.

A Business Consultant

But here the marketer representative is more than a salesman—he is a business consultant. He has under his wing a chain of small businesses, for whose continued existence he is responsible. He does not own them, to be sure. The dealers and their employes, are not on his payroll and he cannot give them orders. But he can inspire each dealer to think of himself as a solid citizen, a permanent member of the community. He can arouse the dealer's determination to stay in business, and to get into fighting trim now.

One weakness the marketer representative will see in the average dealer is insufficient help. The dealer may be inclined to compare the increased size of his present force, with what he had a year ago, instead of what he needs, to do a better job today. Do his men have enough time to satisfy every customer? Can they give the customer not only the service he asks for, but sell the things the customer needs and forgets until he is reminded?

Is the dealer himself too busy to coach his men? To check up on housekeeping, condition of equipment, amount of stock? The marketer representative can keep him posted on what new and improved service equipment is on the market. Then the dealer can decide whether an investment in modern facilities, by giving better service at less cost, will help him to hold his customers, and protect his future profits.

Today merchandise stocks need more attention than ever. As goods begin to flow the dealer who is prompt in stocking up, wins the confidence of his customers. The only way to be prompt is to get out of the mental rut of taking it for granted that goods are scarce and can't be had. Too much thinking about shortages can cause a dealer to miss out on sales he should have.

Profit in Solicitation

And finally, management can show the dealer how he can get good results today by active solicitation of business. Direct solicitation always pays and is doubly effective now because it has been so long neglected. It takes no super salesmanship. If a dealer does nothing more than ask customers for their business, some portion of them will buy, if for no other reason than appreciation of his interest and his desire to be of service.

Most oil marketing companies offer directly, and through their jobbers, some kind of dealer help advertising. Their sales representatives have to get the dealer interested in using it. There is no better way for a dealer to build business for the future than through mail, telephone and personal calls on customers.

In the past few years many young people have reached driving age. Most of the veterans are back home again, after a long absence. Maybe they are settled in a new community. People are constantly moving from one community to another, never more so than during the war. It all adds up to a lot of good prospects, on every street, waiting for some dealer to ask for their business.

To do all these things a dealer must have a well-manned, well-run station. If he can be made to see how his business future depends on the constructive work he does today, management will have done him a lasting service.

Curriculum for Short Course In Gas Technology Set Up

Special to NPN

KINGSVILLE, Tex.—Curriculum for the short course in gas technology scheduled for the Texas College of Arts and Industries campus Aug. 27, 28, and 29, has been announced by Dr. Frank H. Dotterweich, A. & I. engineering department head.

Twelve hours of classroom and laboratory instruction will be offered in each of the following subjects: "Transmission Problems with Special Emphasis on Corrosion Control"; "Air Conditioning with Natural Gas"; "Dehydration of Food and Agricultural Products with Natural Gas". Those who wish to take the course may register for one of the three subjects.

Technical topics of general interest will be discussed in two assemblies. "Petroleum Products from Natural Gas" is the subject for the first assembly, and "Developments in Gas Turbine Design", for the second. A. & I. laboratory equipment will be demonstrated, also.

Field trips will be arranged to cycling plants, chemical plants, citrus dehydration plants, and natural gas dehydration systems upon request. A barbecue given by Kingsville Chamber of Commerce and an inspection trip to the nearby King ranch are also planned.

Registration, other than local enrollment, will be limited to 150, the number for whom dormitory facilities will be available. An enrollment fee of $22.50 includes dormitory accommodations and meals, but a fee of $7.50 will be charged for those not requiring college facilities for room and board.

Would Limit Service Station Price Signs to 8" by 10"

NPN News Bureau

CHICAGO—A law limiting size of service station signs for gasoline prices to 8 inches by 10 inches to be placed only on the pump will be sought at next regular assembly of Illinois Legislature by Gasoline Retailer's Assn., of Metropolitan Chicago.

Elmer Mack, president and business manager of the association since last April, stated that late Gov. Horner vetoed association's original bill in 1937, which was later picked up and passed in some eastern states. "Such a law," Mr. Mack said, "would eliminate the hideous clutter of gasoline signs on city streets and state highways."

Three other points in a four-point program for the association were:

1. Increase in margin of profit to cover increased operating costs. On this point Mr. Mack stated that in Chicago, gasoline was merely used as a "leader" in service stations. "Present margin of 3.1c profit on a gallon of gasoline means a profit margin of roughly 16%, which is certainly too low," he stated. "The Chicago station not equipped for service doesn't stay in business very long," he said.

2. There is a need for establishment of a dealers' credit bureau as a protection against "dead-beat" floaters, he said.

3. Final point calls for "merchandising clinics"—a school where operators and employes learn to sell merchandise and available services "instead of just pumping gasoline".

National Safety Council Congress Scheduled Oct. 7-8

NPN News Bureau

CHICAGO—National Safety Council Congress scheduled to be held here Oct. 7-8 is being whipped into shape, including a program for the Petroleum Section. Program as outlined so far, includes:

Monday, Oct. 7

10 a.m.—API meeting.

2 p.m.—Petroleum Section, Executive Committee meeting.

3:30 p.m.—Veterans of safety meeting.

6:30 p.m.—Veterans of safety banquet.

Tuesday, Oct. 8

2 p.m.—General session, John C. Askam, presiding; report of general chairman.

2:15 p.m.—"Management's Responsibility in the Accident Prevention Program," by James Tanham, The Texas Co., New York.

2:45 p.m.—Discussion.

3 p.m.—Presentation of awards by L. S. Wescoat, vice president and secretary, Pure Oil Co., Chicago.

3:30 p.m.—"Co-Ordinated Plan Between Employe and Management in Controlling Accidents in Pipeline Operations," by Stanley Owens, safety engineer, Tennessee Gas and Transmission Co., Houston.

4 p.m.—Discussion.

NEW KIDDE PORTABLE (model 2½) packs MORE fire-fighting punch... weighs LESS!

New unit holds 2½ pounds of carbon dioxide, compared to 2 pounds for old model . . .

CAPACITY INCREASED 25%!

New model weighs only 8¾ pounds compared to 11 pounds for old model . . .

WEIGHT REDUCED 21.5%!

—ANOTHER KIDDE "FIRE-FIGHTING FIRST"

The fast fire-killing action of carbon dioxide . . . the simple, time-proved advantages of trigger control . . . are now incorporated in a *new* portable extinguisher—the Kidde Model 2½.

Replacing the popular Model 2, this new portable packs 25% *more* fire-fighting power—yet weighs 2¼ pounds less, is easier to handle. The Model 2½ is ideal for smothering small fires in flammable liquids or electrical equipment. Use it in laboratories and other small-hazard areas. No special training needed to operate—just aim at the fire and pull the trigger!

Write today for the full facts on the Model 2½.

Walter Kidde & Company, Inc., 813 Main Street, Belleville 9, New Jersey

Kidde

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Kidde

'46 Gasoline Tax Receipts May Set Record; Material, Labor Shortages Delay Road Work

The problem of carrying out highway improvements will not be one of insufficient funds. Recent trend in state highway revenues indicate rather that the problem will be one of procuring adequate supplies of equipment, materials and manpower, according to the July issue of *Tax Economics Bulletin* of API.

Bulletin goes on to point out that Public Roads Administration reports net receipts from state gasoline taxes in 1945 totaled $783,691,000, an increase of 15% over 1944 receipts. In many states at present gasoline tax receipts already are running ahead of prewar levels.

For states as a whole, gasoline taxes for the first quarter of 1946 amounted to more than $231,000,000, an increase of approximately 32% over the $175,000,000 collected during the same period in 1945 and about 15% above the 1941 first quarter receipts.

Based on this upward trend, Bulletin continues, indications are that after allowing for refunds, net receipts from gasoline taxes at existing rates in 1946 will equal if not exceed the 1941 record high of $957,312,000.

Bulletin declares:

"This sharp recovery has occurred despite the fact that the number of automobiles on the road today is substantially smaller than in 1941. In recent months, however, there has been a perceptible recovery in registrations in a number of states and when the automobile industry is again producing motor vehicles in numbers commensurate with the existing great demand, a further impetus to highway revenue will be realized from the additional registration fee receipts.

"In addition to a greatly improved highway revenue situation, the various states have been able to improve their highway financial positions materially during the war years because of enforced curtailment of expenditures. At the end of the 1945 fiscal year, the combined balances in the various highway funds exceeded half a billion dollars and indications are that the total is even higher at the present time in view of the sharp recovery in revenues in recent months. As soon as conditions permit, these funds will, of course, be available for highway purposes."

Indicative of the material and labor shortage is the fact that out of one billion dollars, Congress to date has appropriated only $175,000,000 under the federal-aid act for the first two postwar years. In short, Bulletin explains, states have been able to avail themselves of less than 20% of the funds which are potentially on a 50-50 matching basis.

Bulletin concludes with this statement:

"In the light of all these factors—a steadily improving highway revenue situation, substantial highway fund balances and the time leeway permitted under the federal-aid legislation—it would appear that the states generally will have ample funds with which to finance their postwar highway projects within the present framework of taxation."

May Shipments of 32,675 Oil Burners Drop 6% Below April Total

May shipments of 32,675 oil burners marked a 6% drop from the April total, according to Department of Commerce report just received. Meanwhile the 159,375 new orders booked during May were equal to about five times the month's deliveries, compared to April new orders which were about four times as large as deliveries.

The grand total of unfilled orders stood at 717,642 at the end of May.

Increases were noted in shipments of complete boiler and furnace units, and in heavy burners, while decreases occurred in water heaters and conversion burners.

Following is a breakdown of the month's activity.

Residential Oil Burners: Production, Shipments, Stocks, and Orders, by Type of Burner, May, 1946

(Number of Burners)

Item	Total	Type of Burner: Atomizing — Low pressure	Atomizing — High pressure	Atomizing — Rotary	Vaporizing — Pot natural draft	Vaporizing — Pot mechanical draft	Vaporizing — Rotary
Residential Burners							
Stocks, beginning of month	2 339	232	1 542	68	360	137	
Production during month	23 659	3 335	18 584	310	1,143	194	93
Shipments during month	23,483	3,483	17,905	183	1,411	216	93
Stocks, end of month	2,707	84	2,221	195	92	115	
New orders, received during month (less cancellations)	66 892	18 477	37 349	4 539	2 595	3 180	842
Unfilled orders, end of month	499,888	49,711	396,124	35 506	3,907	10,721	3,919
Residential Furnace Burner Units							
Stocks, beginning of month	879		733	7	110	29	
Production during month	2,464	124	1,899	65	101	196	79
Shipments during month	2,367	124	1,763	72	119	210	79
Stocks, end of month	976		869		92	15	
New orders received during month (less cancellations)	5 004	482	2 256	378	713	1,128	47
Unfilled orders, end of month	39,200	4,959	18,438	528	2,855	11,047	1,373
Residential Boiler Burner Units—Cast Iron							
Stocks, beginning of month	64		64				
Production during month	66		56				10
Shipments during month	56		46				10
Stocks, end of month	74		74				
New orders, received during month (less cancellations)	[1] 286		[1] 305				19
Unfilled orders, end of month	1,766		1,581				185
Residential Boiler Burner Units—Steel							
Stocks, beginning of month	318	103	215				
Production during month	1,462	580	882				
Shipments during month	1,173	231	942				
Stocks, end of month	607	452	155				
New orders, received during month (less cancellations)	12 919	9 390	3 529				
Unfilled orders, end of month	28,163	10,472	17,691				
Residential Water Heating Units							
Stocks, beginning of month	827		2	3	822		
Production during month	2 236		146	76	2 013		1
Shipments during month	2 639		140	79	2 419		1
Stocks, end of month	424		8		416		
New orders, received during month (less cancellations)	69 281		386	2,131	66,452		12
Unfilled orders, end of month	128,392	51	1,463	4,808	121,686		384

[1] Cancellations exceeded new orders during month.

THIS EMBLEM

is a symbol of motor oil VALUE

North, east, west and south, car owners know the emblem of the Pennsylvania Grade Crude Oil Association. Millions have made it their guide to value—to safe and complete lubrication.

100% Pure Pennsylvania Oil of emblem quality assures you of satisfied customers. This holds true whether you sell to retailers, to the public...or both.

PENNSYLVANIA GRADE
CRUDE OIL ASSOCIATION
Oil City, Pennsylvania

For your protection, only oils made from 100% Pure Pennsylvania Grade Crude which meet our rigid quality requirements are entitled to carry this emblem, the registered badge of source, quality and membership in our Association.

We want
YOU
for a
TERRITORIAL
SALESMAN

. . . IF YOU HAVE THESE QUALIFICATIONS: Successful sales experience calling on dealers in tire, oil, battery or kindred merchandise fields . . . and if your age is between 28 and 35.

VARIOUS LOCALITIES AVAILABLE: Interviews will be arranged at the most convenient place, and as soon as possible.

WE WILL GIVE YOU: Salary, bonus, company car, full expense, careful training, a profitable and workable territory.

WRITE US full particulars about yourself and experience, and send a photograph of yourself.

T. G. Plumb
Sales Personnel Department

★

THE GOODYEAR TIRE & RUBBER COMPANY, INC.

Akron 16, Ohio

Bids on Off-Shore Lands Are Asked by Louisiana

Special to NPN

BATON ROUGE, La.—State of Louisiana has asked for lease bids on Aug. 30 on nearly 2,000,000 acres of off-shore lands, some extending 30 miles out into the Gulf of Mexico. The action was taken at the request of several major oil companies, indicating that these companies think Louisiana's claim on the Gulf's floor this far out is valid.

Basing its claim on submerged lands on the fact that modern artillery can hurl a shell that far (the traditional three-mile limit was the distance of a cannon shot from shore), Louisiana some time ago officially laid claim to hundreds of thousands of such acres of tidal lands.

The four tracts include:

West Cameron area of 176 blocks of 500 acres each which extends from Louisiana's western boundary at the mouth of Sabine Pass eastward across two-thirds of Cameron Parish's coastline and to seaward for nearly 30 miles. It is being offered at the request of Superior Oil Co. which discovered and developed the Creole oil field near the coastline several years ago.

Ship shoal area, extending to sea a full 30 miles, and South Pelto area, the first of 162 blocks and the latter of 25. Both tracts lie to the east of Pointe Au Fer area, parts of which were leased last year by Magnolia Petroleum Co. in the first off-shore leasing by the state. Magnolia also asked that the areas be offered.

Fourth tract offered is Grand Isle area, made up of 74 blocks, put up for lease at the request of Shell Oil Co.

The three companies which have asked Board of Mineral Development to offer off-shore areas for lease, together with the Texas Company and others, have been active in recent years in geophysical work in the Gulf of Mexico.

All bids on the areas, according to the minerals board's terms, must offer a cash bonus for the lease, with a primary term not to exceed five years.

Minimum royalties must be one-eighth of all oil produced and saved; one-eighth of all gas produced, saved, or utilized; 75c for each long ton of sulfur produced and saved; 10c a ton for all potash, and one-eighth of all other liquid or gaseous hydrocarbon minerals. Lessees must agree to drill within a year or to pay rental for the right to defer drilling for a period not to exceed five years.

Recommends Giving U. S. Title To Elk Basin Oil Lands

NPN News Bureau

WASHINGTON—Special Master Nat U. Brown of Yakima, Wash., has recommended to Supreme Court that government be given clear title to 640 acres of land in Elk Basin oil field east of Yellowstone Park in Wyoming.

Suit had been brought by U.S. against state of Wyoming and Ohio Oil Co. on grounds that land rented to state for school purposes does not pass to state until land is surveyed and survey approved by General Land Office.

Land had been conveyed to Wyoming or maintenance of schools, and since 1917 state has issued oil and gas leases to Ohio Oil Co. Government argued that title could not pass to state, if the land was of known mineral character and had been included in Naval Petroleum Reserve No. 2 before survey was approved.

Accounting of oil and gas taken by Ohio Oil Co. has been asked. Case is expected to be argued before Supreme Court late this fall or coming winter.

Petroleum Field Research, Training Set at Texas U.

Special to NPN

AUSTIN—Field research and training for the petroleum industry will be centered at University of Texas for the coming year, through a $6,000 grant received from American Assn. of Oilwell Drilling Contractors.

For 14 years University of Texas Industrial and Business Extension Training Bureau has worked with the petroleum industry of the state in furtherance of industrial education and research in oilwell drilling.

W. T. Payne, Oklahoma City drilling contractor, oil operator and president of the contractors' organization, offered the grant for the association and it was accepted by the Board of Regents at its July meeting.

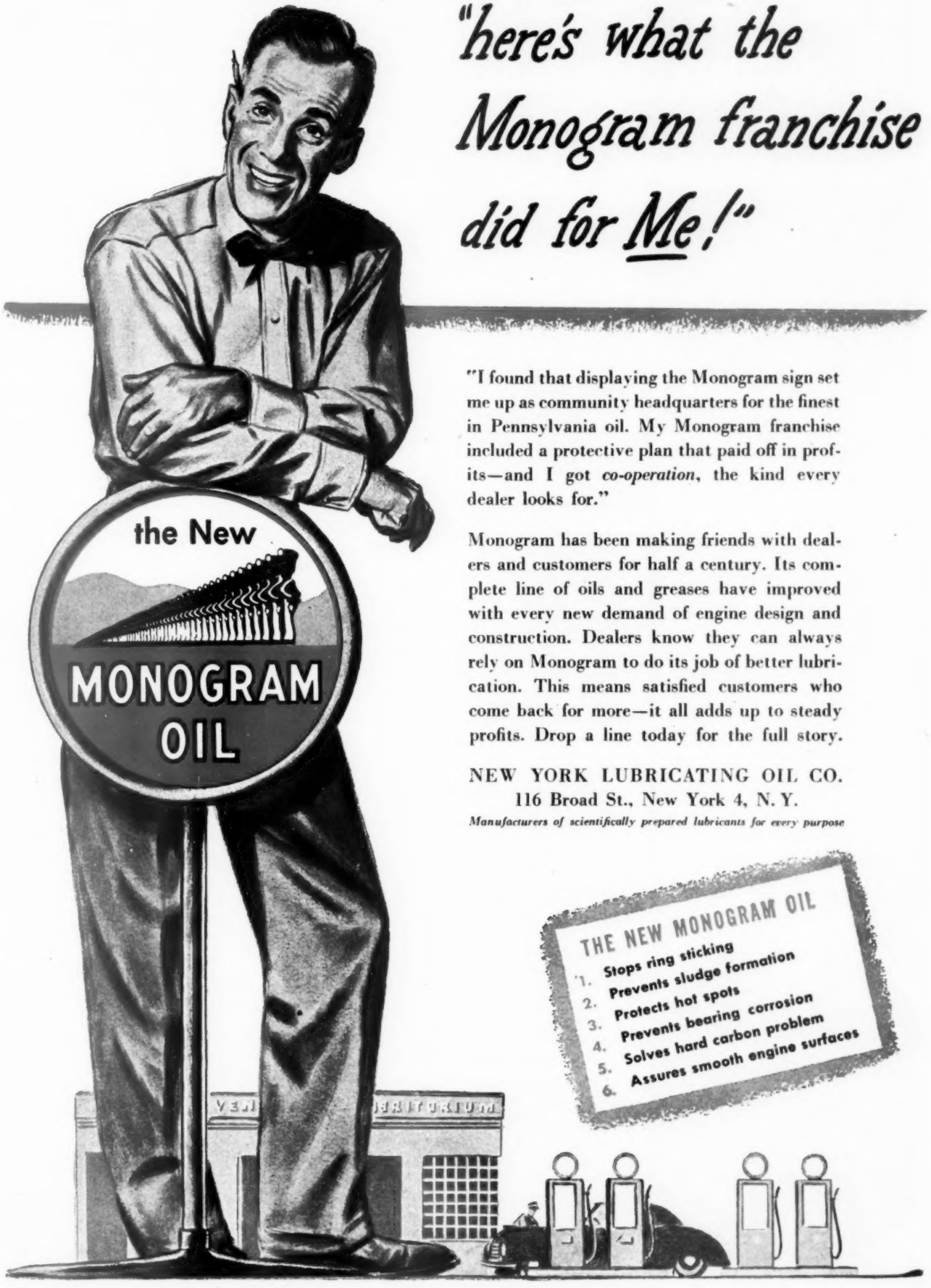
Plans for use of the money have been developed by Dean T. H. Shelby of Division of Extension, James R. D. Eddy, director of Industrial and Business Extension Bureau and John Woodruff, state co-ordinator of petroleum industry training.

These men will work with a committee on research and education of the Contractors' Assn., of which J. E. Warren of Midland is chairman. Other committee members are: Howard Holmes, Dallas; Travis Kerr, Oklahoma City; C. W. Alcorn of Houston and L. W. Sullivan of Tulsa.

In Texas work will be developed with the co-operation of the trade and industries division of the State Board for Vocational Education. In other oil-producing states work will be carried on in co-ordination with state and local industrial education authorities.

Experimental work has been completed at Odessa, Kermit and Wichita Falls. Plans for the coming year call for establishment of centers at Rangely, Colo.; Great Bend, Kan.; Oklahoma City and Tulsa, Okla.; Hobbs, New Mexico; Shreveport, La.; and Kilgore, Beaumont, Houston and Corpus Christi, Texas.

The first phase of the program will consist of field research and training in the use and control of drilling fluids. Drilling equipment and drilling practice are scheduled for attention as the work develops.



"here's what the Monogram franchise did for Me!"

"I found that displaying the Monogram sign set me up as community headquarters for the finest in Pennsylvania oil. My Monogram franchise included a protective plan that paid off in profits—and I got *co-operation*, the kind every dealer looks for."

Monogram has been making friends with dealers and customers for half a century. Its complete line of oils and greases have improved with every new demand of engine design and construction. Dealers know they can always rely on Monogram to do its job of better lubrication. This means satisfied customers who come back for more—it all adds up to steady profits. Drop a line today for the full story.

NEW YORK LUBRICATING OIL CO.
116 Broad St., New York 4, N. Y.
Manufacturers of scientifically prepared lubricants for every purpose

THE NEW MONOGRAM OIL

1. Stops ring sticking
2. Prevents sludge formation
3. Protects hot spots
4. Prevents bearing corrosion
5. Solves hard carbon problem
6. Assures smooth engine surfaces

PETRONATE
(Reg. U. S. Pat. Off.)
Now Available in
3
MOLECULAR WEIGHTS

PETRONATE is a purified, highly concentrated petroleum sulfonate—free of all impurities—absolutely uniform in all essential properties. Write Dept. NP 8 for sample, indicating molecular weight desired and use intended.

Molecular weight

PETRONATE H—500/525

PETRONATE—440/470

PETRONATE L—415/430

White Oil
and Petrolatum Division
L. SONNEBORN SONS, INC.
88 Lexington Ave., New York 16, N. Y.
Refineries: Petrolia and Franklin, Pa. Branch offices: Chicago, Baltimore, Philadelphia, Los Angeles. Stocks carried in principal cities.
In the Southwest:
Sonneborn Bros., Dallas 1, Texas

Publications for Oil Men Planned by Texas University

Special to NPN

AUSTIN, Tex.—A number of publications by Bureau of Economic Geology at University of Texas, which will be of particular interest to Texas geologists, industrialists, oil men and mining interests, are in press or awaiting publication and will be available for distribution in the fall, Dr. J. T. Lonsdale, bureau director, announced last week.

Among the publications are:

Structural map of Texas by Dr. E. H. Sellars and Dr. Leo Hendricks, now being printed. This is the third edition of the map which is on a scale to 1 to 500,000, with 500-foot contour intervals.

Publication 4301, Texas Mineral Resources, is in the hands of the printer. It contains 26 separate papers by various authors on minerals in Texas.

Publication 4246, Building Stones of Central Texas, is in the hands of the printer. It reports the results of exhaustive investigation of building stones by the Bureau of Economic Geology and the Bureau of Engineering Research.

Publication 4329, Carboniferous Rocks of the Llano Region of Central Texas by F. B. Plummer is awaiting publication. It contains detailed information concerning the carboniferous strata, which strata are important in oil fields north of the Llano region.

Publication 4621, The Ellenburger Group of Central Texas by Dr. V. E. Barnes and Dr. E. P. Cloud, is nearly ready to go to the printer. This publication will report results of a joint survey between Bureau of Economic Geology and U. S. Geological Survey. It is one of the oil and gas investigations undertaken to develop basic data of potential value in discovering additional oil reserves where the Ellenburger strata are beneath the surface and are potential producers of oil.

Asserts Oil Conservation Helped Win World War II

Special to NPN

DENTON, Tex. — Texas was able to oil the Allied nations to victory in World War II because of proper petroleum conservation, Col. Ernest O. Thompson of Texas Railroad Commission declared last week in an address before a resource-use workshop at North Texas State College here. Workshop sponsored by regional Committee on Resource-Use Education.

Colonel Thompson said, "We have moved into an oil age and it has advanced our standard of living. Our economy today is largely supported by oil and gas. This is particularly true in Texas, where our present and future economy is closely tied in with the success of oil producing, refining and marketing. The petroleum industry in 1945 paid 52% of all state business and property taxes in Texas. Surely it is to Texas' interest to prevent all possible waste of oil."

The commissioner then traced the development of oil conservation practices and discounted any predictions of an oil shortage.

Canada's Crude Oil Imports Increase 15,308,273 Bbls.

Special to NPN

OTTAWA — Canadian imports of crude oil increased 15,308,273 bbls. in 1945 as compared with 1940. Largest increase was that imported from Venezuela which increased from 3,251,735 bbls. in 1940 to 16,043,924 bbls. in 1945.

Imports of crude oil from the United States increased from 29,120,076 bbls. to 32,424,624 bbls. in 1945. Illinois leads in amount of crude exported to Canada with a total of 12,887,402 bbls.

Figures on imports of crude oil as compiled by Canada's Department of Trade and Commerce follow:

Crude Oil Received By Canadian Refineries

(Figures in barrels of 35 Imperial gallons)

	1940	1945
DOMESTIC CRUDE OIL		
Turner Valley	8,155,077	6,955,769
Other Alberta Fields	31,294	627,804
Ontario Fields	185,633	113,086
Total Domestic	8,372,004	7,696,659
IMPORTED CRUDE OIL		
United States		
Texas	4,170,616	5,315,458
Midcontinent	1,273,406	5,411,800
Oklahoma		3,303,309
Kansas		496,836
Illinois	16,251,018	12,887,402
Louisiana	1,045,682	12,728
Wyoming		26,720
Montana	484,329	1,203,265
California	5,805,492	3,767,106
Miscellaneous	89,533	
Total U. S.	290,120,076	32,424,624
Trinidad	227,286	
Colombia	9,742,631	8,374,214
Venezuela	3,251,735	16,043,924
Ecuador		1,152,536
Peru	345,317	
Total Imported	42,687,045	57,995,318

Texas Tax Rate Cut Means Savings for Oil Industry

Special to NPN

AUSTIN — Texas taxpayers, and the vast state oil industry in particular, will save hundreds of thousands of dollars on their ad valorem taxes as the result of the State Automatic Tax Board cutting the state tax rate from 72 cents to 37 cents, the lowest state tax rate since 1912.

The board estimated it will result in a savings of $14,766,000 for the tax year The cut was effected by eliminating entirely the customary 35-cent impost for the state's all-purpose general fund, the first such action in the state's history.

Morever, the state does not plan to use any of the general fund balance of $24,346,279 for current government operations.

The healthy state of Texas' finances is seen in the fact that in 1942 the general fund had a deficit of over $34,000,000. Since that time the deficit has been wiped out and the present balance substituted.

Comptroller George Sheppard said that one factor in holding the balance up was the failure of crude oil production to drop 25 to 30 per cent with the end of the war as had been predicted, and the income from oil production taxes continued to swell the state's finances.

Prevent Leaks

CAUSED BY EXPANSION!

PLATE 860-N

4" Non-Rising Stem McDonald Expansion Relief Gate Valve, furnished in flanged type only. Iron body. Solid wedge—bronze faced—guided both sides. Bronze seats. Bronze stem.

PLATE 858

McDonald Expansion Relief Gate Valve, available in following types and sizes:
Plate 858—Standard Type—2", 2½", 3"
Plate 859—Lock Type—2", 2½", 3"
Plate 860—Flanged Standard Type—2½", 3"
Plate 861—Flanged Lock Type—2½", 3"

SUN-PROTECTION FOR YOUR LINES

● Every summer, heat causes expansion in your lines, expansion causes pressure and pressure causes leaks at joints and gaskets. McDonald Expansion Relief Gate Valves have been specially developed to prevent those leaks. When pressure builds up, the disc in the by-pass opens, causing pressure in line to equalize itself with that of the tank. It's a complete, clean and permanent solution that does away with unsightly and unsatisfactory overhead lines and other makeshift arrangements—economical insurance against a common hazard. Get the facts—we'll be glad to send them on request.

A. Y. McDONALD MFG. CO.
"The Home of the Swing Joint"
DUBUQUE, IOWA
There's a McDonald Branch or Distributor Near You

McDONALD
EXPANSION RELIEF GATE VALVES

New Field Opening for Exploring Hydrocarbons By Utilization of Physical Methods of Analysis

UOP's Riverside Laboratory obtains reliable quantitative analyses of alkylation and isomerization products with this Infrared Absorption Spectrometer

By NPN Staff Writer

CHICAGO — Spectrographic and other physical methods for identifying and analyzing petroleum fractions and for determining the properties of catalysts are being intensively applied in the Physics Division of Riverside laboratories of Universal Oil Products Co., near here.

Not only is important data obtained which it is many times impossible to secure by chemical methods of analysis, but in many instances only a fraction of the time is required for testing, as compared with the earlier conventional means. Physical testing facilities at Riverside served an important function in improving operation of many of the wartime refining units.

New apparatus has been added and entire facilities are now assembled in a new building, at an investment cost of around $250,000 which was officially offered Aug. 1. The physical testing equipment is said to be more complete than in any other research institution or oil company laboratory in the country.

Physics Division at Riverside had its beginning in 1939, when it was necessary to find new means for the study of the properties of solid catalysts, which were then just beginning to be used in petroleum refining. Up to that time, little attention had been given to the possibilities for applying physical methods to solving chemical problems in refining. First work of Physics Division was a study of catalysts then in use, to determine controlling factors with regard to catalyst life, activity, mechanical strength and utilization.

Activities were later extended to cover investigation of petroleum, gases and other materials, as well as catalysts. Keeping pace with the general advance in physical research methods, UOP adopted in its laboratories new techniques that could profitably be applied in the petroleum industry.

Principal physical testing facilities provided at Riverside and their application, largely in solving some of the wartime refining problems, are listed below:

Ultraviolet Spectrophotometer—Used in controlling operation of hydroforming units for maximum production of toluene and in control of plants making butadiene and styrene for synthetic rubber.

Infrared Spectrometer—Used in the study of products of alkylation and isomerization plants which led to increased production of better aviation gasoline.

Raman Spectroscope—Used to complement infrared absorption work.

Mass Spectrometer—A new tool for the quantitative analysis of complex mixtures of light hydrocarbon gases encountered in many refining operations, by means of which trace impurities can be determined.

Emission Spectrograph—Gives positive identification of the presence of given elements and is sensitive to minutest traces.

X-Ray Diffraction—Used in the study of catalyst materials and aided in the development of a superior hydroforming catalyst for production of toluene for the war and for improving postwar motor gasolines.

Electron Microscope—Used for studying the particle size and shape of catalyst supports.

In addition to the above the new building of Physics Division includes a general laboratory in which physicochemical studies on catalysts, oils and other materials are carried out. An example of the work done in this laboratory is the development of a metallic aluminum catalyst for the removal of certain impurities in the finished alkylate from hydrogen fluoride alkylation.

Catalyst finally developed consisted of one-inch raschig rings made from metallic aluminum strips. The rings were made active for the impurities in question by etching them in a solution of hydrochloric acid. This ring form of catalyst was used in large quantities in the wartime alkylation plants and resulted in the recovery of hydrogen fluoride valued at many thousands of dollars.

New facilities of Physics Division are only one department of the UOP Riverside laboratories which cover around 27 acres and employ a research staff of around 250.

C. G. Gerhold is manager of the entire Riverside laboratory and Dr. G. M. Webb is director of the Physics Division.

New Chemical Source Opened By Propane, Other Light Gases

Special to NPN

BARTLESVILLE, OKLA.—Source of new chemicals is opened by propane and other light hydrocarbon gases which the oil industry formerly wasted, Weller R. Pierce of Phillips Petroleum Co., declares in a report to Wichita Section of American Chemical Society.

The light gases, which are compounds of the elements hydrogen and carbon, he points out, are now utilized chiefly for fuel and for the manufacture of carbon black, but great interest has developed recently in employing the gases as building blocks in the production of chemicals.

Turning to synthetic gasoline, Mr. Pierce said:

"The Fischer-Tropsch synthesis of gasoline, a German development, has possibilities of becoming important in this country. Lubricating oils, edible fats, solvents, alcohols, aldehydes and acids were obtained as by-products from the process. The gasoline produced in Europe by this process was of low octane value and would need further refining to compete with the motor fuel sold in this country today.

"From present information, however, if the economics of the. . .process are based on the production of gasoline from a low-cost feed stock and with by-product credit given, the cost of motor fuel made by this method could be competitive with the price of gasoline produced in the United States under present conditions."

Heavy-duty ICC Drums and Bilge Barrels

★

Light-gage Shippers, 55, 30, and 15 gal. capacity and 100 lb. Grease Drums

★

Lightweight Drums for Chemical and Powdered Materials

★

Painted Various Colors or Decorated

For an attractive, safe container use J&L Steel Barrels

When sending your product to your customers, use the container that will get it there safely and present an attractive appearance all the time it is in use. Use J&L steel barrels for grease, oils, alcohols, paints, and other liquids and semi-solids.

Ship in Safety • Ship in Steel

J & L STEEL BARREL COMPANY

A SUBSIDIARY OF JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PA.

PLANTS:
BAYONNE, N. J. • CLEVELAND, OHIO • PHILADELPHIA, PA. • NEW ORLEANS (GRETNA), LA.
NO. KANSAS CITY, MO. • PORT ARTHUR, TEXAS

Short Haul Business Is Seen Objective of the Railroads

NPN News Bureau

CHICAGO — Freight rates situation on petroleum products in the Midwest is now very badly confused, according to oil company traffic managers.

All of the country's railroads have asked ICC for a 25% over-all increase with limit of 6c per 100 lbs. on tank car shipments of petroleum products, but several Midwest roads are proposing local decreases. Apparently, the rails consider the loss of long haul traffic to pipelines and inland waterways as inevitable and are going after short haul traffic from pipeline and water terminals, which is now handled by trucks.

Rails in state of Wisconsin for example, recently proposed a substantial reduction in varying amounts, applying on intra-state shipments from terminals at Green Bay, Milwaukee, La Crosse, Superior and others, and inter-state from pipeline terminals at Minneapolis and Winona, Minn. Interstate Commerce Commisson approved the proposed rates, effective July 15, but the Wisconsin State commission refused them, and set hearing for Aug. 9 at Madison, which may result in the approval.

At ICC hearing here last week, it was reported that Western Trunk Line Freight Traffic Managers Committee had recommended drastic reductions to various points in Illinois, and that recommendation would probably receive final approval of rails.

MIDWEST COLUMN

(*Continued from p.* 9)

homa and Texas, would give these refiners a pipeline outlet but would involve a big switch in their markets. Normally, their best markets by rail are Nebraska, Iowa and North Dakota and proposed pipeline outlet would take them into Illinois, Indiana and Ohio.

Missing link in the products price chain that appears to be coming up in the many price changes is wider margins for Independent jobbers. All refiners' prices have not yet advanced the full amount of the tank wagon increases, but in some instances they have and others seem headed that way.

Jobbers as well as refiners have had expense increases since prewar that need offsetting—higher wages, higher material and equipment costs, higher freight rates —higher everything in expense. Any lack of wider margins can not be blamed upon OPA now. It's an industry problem. Integrated companies can split the varying price increases on gasoline up to 01.2c tank wagon in any manner they choose—give some of it to their bulk plants to offset increased operating costs if they like. That's just a matter of intra-company bookkeeping. But jobbers who must pay their own freight do not get any increased margin if refinery and tank wagon prices advance the same amount.

Same thing is happening in fuel oils. In Chicago for example one major has raised the wholesale price of burning oils 0.5c, with tank wagon increase of only 0.4c. Another major has increased heavy oil wholesale 0.25c, with no increase in tank wagon price yet. Other changes are of varying amounts.

It is quite possible that the differentials are only temporary and are due to the confusion of so many changes at once, but they do put pressure on Independent jobbers and distributors.

° ° °

Last of the low-price battlers in the Twin Cities is due to eliminate at least some of the drastic retail price cut there as this is written.

Oilmen in that area do things differently as explained by the Minneapolis Journal. They celebrated their OPA price freedom by staging an old fashioned price war. Two of the Independent price marketers have been retailing six gallons of Ethyl for $1 and a third sold six gallons of regular for 95c, all tax paid. The fight started on July 11 and on July 19, Standard of Indiana knocked 1.5c off the tank wagon, part of which was restored on July 30.

° ° °

Since 1947 is a legislative year, Petroleum Industries secretaries and committeemen in various states are holding county meetings. Some have about finished while others are in the midst of their programs. For instance, Harlan M. Whisman, secretary in Minnesota, has held 35 meetings since April 15, and has 25 or 30 more to go this year. There are 87 counties in the state.

Army Pipeline Man, Oil Vet, Switches from A-NPB to UNRA

NPN News Bureau

WASHINGTON—J. R. Keany, one-time Boston printing plant proprietor who went overseas an enlisted man in May, 1942, to become a member of the Army's first pipeline company and came back a captain and petroleum veteran, has transferred from A-NPB to UNRRA as chief of its petroleum section.

During his last seven months in uniform, he served A-NPB in its Distribution Division, handling Mediterranean matters.

He led his pipeline company, organized in England, in the African invasion. Commissioned in the field in June, 1943, he was placed in charge of bulk storage and tanker discharge, Mediterranean Base Section. In October, 1944, he was transferred to the Petroleum Section, AFHQ, at Caserta, Italy, becoming assistant transportation officer in charge of pipeline throughput and rail tank cars.

He got back to the States in May, 1945, joining A-NPB last October.

Ten Chicago Teamster Locals Agree on New Pay Contract

NPN News Bureau

CHICAGO—Ten local unions of International Brotherhood of Teamsters and Chauffeurs (AFL), representing an estimated 800-900 petroleum truck drivers in metropolitan Chicago area have agreed on terms of a new contract.

Contract, which was to come up for vote of approval Aug. 13 by members, calls for 9c an hour increase for 40-hour week with time and half for overtime and a guaranteed work week of 48 hours. Union representative stated that pay increase amounts to $4.68 weekly and is same for city and over-the-road drivers. New contract expires July 1, 1947, according to petroleum haulers and, say haulers, gives drivers $66 weekly income.

4 Oil Companies, Steamship Firm to Get Surplus Tankers

NPN News Bureau

WASHINGTON—Four oil companies and one steamship firm last week were authorized by USMC to purchase one surplus T-3 tanker each from nation's temporary reserve fleet.

Allocations were made to Cities Service Oil Co., Gulf Oil Corp., Richfield Oil Corp., Sinclair Refining Co., and Hillcone Steamship Co. Preference due to war losses of tankers, USMC explained, determined allocations. Applications by 2 companies were rejected.

Tankers allocated are the Chiwawa, Escalante, Neshanic, Sparrows Point and Cornell, all built in Bethlehem-Sparrows Point shipyard, Baltimore, in 1942 and 1943.

Unadjusted statutory sales price of five tankers is $1,903,125 each. Final approval of sales has yet to be made by USMC. Latter said applications had been received for 15 T-3's but only five were available for allocation.

Sale of six T-2 type tankers has been announced by the commission.

Exact prices were not set but purchasers will pay between $1,505,352, floor price, and $2,062,500, unadjusted statutory sales price, for each of tankers. Six vessels include Malvern Hill and Chadd's Ford to Jersey Standard, Fort Mercer and New Market to Barber Asphalt Co., Diamond Island to Motor Tankship Corp., and Waxhaws to Sun Oil Co.

June Oil Trucking Tonnage Up

WASHINGTON — June transportation of petroleum products by motor carriers totaled 240,837 tons, up 5.2% from May and 5.3% from June, 1945, ATA has announced. Petroleum products tonnage accounted for about 14% of 1,758,734 tons of freight hauled by all types of motor carriers reporting to ATA from 39 states.

"Your story better be good, brother!"

T.A.E.: "It *is* good, officer. I'm a Timken Axle engineer . . ."

Officer: "What's that got to do with highballing this baby way above ceiling?"

T.A.E.: "It's like this, officer. I'm road-testing* a new Timken heavy-duty Two-Speed Axle to see just how much it *will* take—and brother, it'll take plenty!"

Officer: "Yeah—I know."

T.A.E.: "But you *don't* know, officer. Why, you can drive this baby in low speed without it even working up a sweat!"

Officer: "Yeah—and it does all right in *high* speed, too."

T.A.E.: "What's more, the new Timken Power Brakes on this baby are a dream—and brake chambers are in a new protected location."

Officer: "Now, there is some sense to that."

T.A.E.: "Say officer, in the interest of—er—better transportation, couldn't you let us continue our test without . . . well, you know . . ."

Officer: "Okay, boys! Away with you—before you talk me into giving you a police escort."

T.A.E.: "High and low axle gear ratios are just right. Just the proper 'spread' to meet the greatest number of operating conditions. What's more, with the new Timken Easy Power Shift you can change axle ratios without clutching—and you don't lose vehicle speed."

Officer: "You can say *that* again."

*—*It's true—Timken Axle engineers regularly get out on the road and check Timken equipment under actual operating conditions.*

New S & U-200 Single-Speed Double-Reduction Axle is a companion axle to new S & U-300 Two-Speed Double-Reduction. Designed for hauling over 18,000 pounds at tires on ground per axle, each offers these exclusive modern features: New hypoid-helical double-reduction drive . . . new differential with 9-16 tooth combination . . . new, stronger shaft design and stronger splines . . . new interjacent pinion shaft location . . . plus scores of others. Data on ALUMINUM housing, brake shoes and hubs on "S" Series for weight saving available upon request.

The Accepted Standard

TIMKEN AXLES

THE TIMKEN-DETROIT AXLE CO., DETROIT 32, MICH.
WISCONSIN AXLE DIVISION • OSHKOSH, WIS.
TIMKEN AXLE BRAKE DIVISION • DETROIT 32, MICH.

90/95 V.I.
SOLVENT-REFINED
LUBRICATING OILS
in
Tank Cars for
Domestic Consumption
Drums for Export
Manufactured by
British-American Oil Co., Ltd.
Toronto, Canada
Address Inquiries to
INDUSTRIAL RAW
MATERIALS CORP.
52 Wall Street New York 5, N. Y.

MIDWESTERN — Refiners' prices for all products steadied the past week following a week of unsettled conditions. With increased crude costs, some refiners were quick to announce advances in products prices; others took several days of deliberation in working out new schedules.

As the week ended, Ethyl gasoline was quoted at 7.75 to 8.25c with one refiner at the high, two at the low, one asking 7.875c and three quoting 8c. Regular-grade quotations reported by refiners ranged from 6.75 to 7c, Group 3, with two at the low and eight at the high.

For light burning oils, most refiners asked an additional 0.5c over former OPA ceiling prices; one refiner, however, reported advancing his quotation only 0.25c. Kerosine, 41-43, quotations ranged from 5.25 to 5.375c, No. 1 p. w., 4.75 to 4.875c and No. 3 gas oil, 4.375c to 4.5c.

Prices for No. 6 fuel were reported 10.5 to 21c per bbl. higher, ranging from $1.285 to $1.39, Group 3.

Confusion in the supply market reduced tank car marketers to almost complete inactivity. Some marketers said they had been unable to buy gasoline at prices which permitted them to sell to jobbers at a profit. Major companies, they said, were still scouring the market for gasoline, and independent refiners were holding for top prices.

* * *

CENTRAL MICHIGAN—Refiners in central Michigan for the most part advanced gasoline prices 1c a gal., residual fuels and light burning oils 0.5c, following 25c per bbl. increase in their crude costs.

Ethyl gasoline ended the past week with quotations ranging from 9.25 to 10.55c; regular-grade was quoted at 8.25 to 9.25c, and straight-run gasoline, 6 to 7c.

In spite of price increases, refiners said jobber demand continued heavy, and their inventories were dwindling as a result. Some said they were behind on shipments of straight-run gasoline.

* * *

MIDCONTINENT — Prices in nearly all districts of the Midcontinent rose the past week to compensate for 25c per bbl. crude price increase. With exception of Kansas, where demand for gasoline is said to have dropped slightly, refiners generally reported continued heavy shipments. Little activity was reported in heating oils.

Grade 26-70 natural gasoline prices were up another 0.25c, with sellers quoting 4c, F.O.B. Group 3, and 3.5c F.O.B. Breckenridge.

Several Midcontinent refiners reported falling in inquiry for heavy fuels. Most of them, however, said their entire output was under contract, railroads taking the bulk of production.

Shipments of most products were largely against contracts, according to reports. An Oklahoma refiner, however, reported the following open spot sales: one car Ethyl gasoline at 7.75c, two cars regular-grade at 7c, one car range oil at 5c to Midwest jobbers and two cars No. 1 straw fuel at 4.75c to a light plant.

* * *

WESTERN PENNA. — Advance in prices of all products in both upper and lower fields began early the past week.

Regular-grade gasoline was quoted from 7.5 to 7.75c in Bradford-Warren district, up 0.25c on the low, while in lower field advance was 6.5c with refiners quoting from 7.5c to 8.25c.

Distillates moved more slowly as two refiners continued to quote old prices during first part of week. However, on Aug. 2 prices were reported generally up on both highs and lows. Kerosine, which had been quoted at 6.925c on the low by one refiner, was posted at 7.25 to 7.425c. Light fuels advanced proportionately, No. 2 fuel, for example, being quoted at 6.75-6.875c.

As new price structure took shape, most refiners withdrew prices on lubes. However, on July 29 one refiner posted prices on some grades of cylinder stock 4 to 8c higher than former OPA ceilings and also raised his prices for neutrals, 25 p.t., 5c and bright stock, 25 p.t.,

Platt's
OILGRAM NEWS
Brief Accurate Fast
Fast Accurate Brief
For Executives of Small Companies, too!
OILGRAM NEWS helps executives of both small and large companies.
In fact, the top men in small companies often have more at stake on a single decision—therefore, have more need for brief, straightforward, unbiased facts about the oil industry every day.
OILGRAM NEWS saves any executive's time . . . helps him make the right decisions quickly.
Why hesitate longer? Try OILGRAM NEWS for awhile and see how it helps you.
FREE *One month trial subscription, upon request. Please use your company letterhead.*
Write to: THE W. C. PLATT COMPANY
1213 West Third Street, Cleveland 13, Ohio
Brief, accurate, daily reports to help busy executives make profitable decisions quickly

2.5c. Same refiner advanced prices of petrolatums & wax 1 to 3c.

Other refiners said in midweek they would shortly post new prices for lubes, but surprise 25c per bbl. increase in price of Penna.-grade crude on Aug. 1 was reported to have upset refiners' calculations. Tight market for lubes led some refiners to predict that it might be some time before open prices were posted generally.

* * *

ATLANTIC COAST—Touched off by general increase in price of Texas and Midcontinent crudes, prices for refined products advanced progressively from north to south along Atlantic Seaboard during week ended Aug. 2.

Following advance in all products by major at New York and New England points on July 27, suppliers at Albany, Boston, Portland and Providence were quoting gasoline 0.9c higher early in week. Distillates were up 0.7c at these points, and residual fuels were quoted 20 to 30c over old levels.

By Aug. 1 general increases were reported from New York Harbor to Charleston and, as week ended, several suppliers advanced prices at points from Savannah to Tampa. One refiner at latter points continued to quote at old prices, but indicated revision would be made over weekend. Prices at Pensacola, Mobile and New Orleans were also up on all products.

Increases varied from point to point but, as reported by suppliers, could be broken down as follows: gasoline, regular-grade and Ethyl, up 0.5 to 1c; kerosine and light fuels up 0.6 to 0.7c; residual fuels up 20 to 30c per bbl. At Philadelphia general advance in price of distillates was 0.5c and one supplier at Philadelphia and Baltimore increased light fuels 0.9c, residual fuels 35c per bbl.

* * *

GULF COAST—Traders at the Gulf the past week were cast adrift in first free market since 1941. Some suppliers immediately quoted new prices reflecting general increase in price of crude; others withdrew old prices but said they would wait on sidelines for awhile before committing themselves to new schedules.

As week ended all grades of gasoline were quoted generally 1c over previous levels for cargoes. Kerosine was up 0.625 to 1c and No. 2 fuel advanced 0.625 to 0.75c, with similar rise in price of Diesel and gas oils. One supplier offered heavy fuel, 28 API gravity & Above, at $2.11 in ships bunkers, up 25c, while No. 5 fuel was still said to be offered at level of $1.55 established previous week.

Widest spread in quotations was for bunkers. Major supplier posted $1.38 on July 31, while two suppliers quoted $1.60, a 42c jump over old level of $1.18.

Suppliers were said to be offering cargoes at new price levels, but only open spot sale reported during week was 20,000-bbl. part-cargo of No. 2 fuel at 5c for lifting Aug. 1. All other sales reported were on "market-price-date-of-lifting" basis.

CRUDE PRICES

Complete tables of crude oil prices usually appear in last issue each month of NATIONAL PETROLEUM NEWS. The tables were not available, due to the many changes late in July, for the July 31st issue. They are published in this issue on pages 60 and 61.

Helps Texas Tax Take

AUSTIN—The Texas tax collector will benefit an additional $7,500,000 annually from the 25c increase on the price of crude oil, State Comptroller George Sheppard has estimated. This windfall will come from the state's production tax on oil.

Mr. Sheppard based his estimate on the assumption the daily average production of crude will remain at the 2,000,000 b/d figure for the next 12 months.

Petroleos Mexicanos Prices Up

MEXICO CITY — Government-controlled Petroleos Mexicanos has advanced its postings for bunker C fuel 20c per bbl., Diesel fuel 25c, at Mexican Gulf ports, effective Aug. 1.

New ships' bunkers prices are $1.38 for bunker C, $2.11 for Diesel, at Tampico, Veracruz, and Minatitlan.

Summary of Daily Gasoline Prices (July 29 to August 5)

U.S. Motor (ASTM octane)	Monday Aug. 5	Friday Aug. 2	Thursday Aug. 1	Wednesday July 31	Tuesday July 30
78-78.5 octane Ethyl:					
Oklahoma	7.75–8.25	7.75–8.25	7.75–8.25	7.75–8.25	7.25–8.25
Mid-Western (Group 3 basis)	7.75–8.25	7.75–8.25	7.75–8.25	7.75–8.25	6.75–8.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	8	8	8	8	8
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	8	8	8	8	8
E. Tex. (Truck Tnsp.)	8	8	8	8	8
73-75 octane:					
Oklahoma	6.75–7	6.75–7	6.75–7	6.75–7	6.75–7
Mid-Western (Group 3 basis)	6.75–7	6.75–7	6.75–7	6.75–7	6–7
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
E. Tex. (Truck Tnsp.)	7	7	7	7	7
63-66 octane:					
Oklahoma	6.625(1)	6.625(1)	6.625(1)	6.625(1)	6.625(1)
Mid-Western (Group 3 basis)	6.375(1)	6.375(1)	6.375(1)	6.375(1)	6.375(1)
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.625(1)	6.625(1)	6.625(1)	6.625(1)	6.625(1)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.625(2)	6.625(2)	6.625(2)	6.625(2)	6.625(2)
E. Tex. (Truck Tnsp.)	....	....	....	....	....
60 octane & below:					
Oklahoma	6.25	6.25	6.25	6.25	5.75–6.25
Mid-Western (Group 3 basis)	6–6.25	6–6.25	6–6.25	6–6.25	6–6.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.25–6.3	6.25–6.3	6.25–6.3	6.25	6.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.25	6.25	6.25	6.25	6.25
E. Tex. (Truck Tnsp.)	6–6.25	6–6.25	6–6.25	6–6.25	6–6.25
Motor Gasoline, 78-78.5 oct. Ethyl (a)					
New York harbor	(2)8.8–10.4(1)	(2)8.8–10.4(1)	(1)8.8–10.4(1)	(2)7.9–10.4(1)	(2)7.9–10.4(1)
New York harbor, barges	(2)8.7–8.9(1)	(2)8.7–8.9(1)	(1)8.7–8.9(1)	(2)7.8–8.9(1)	(2)7.8–7.9(2)
Philadelphia	(1)8.8–10.25(1)	(1)8.8–10.25(1)	(1)8.8–10.25(1)	(2)7.9–10.25(1)	(2)7.9–9.25(1)
Philadelphia, barges	(1)8.7–8.9(1)	(1)8.7–8.9(1)	(1)8.7–8.9(1)	(2)7.8–8.9(1)	(2)7.8–7.9(1)
Baltimore	(1)8.35–9.65(1)	(1)8.35–9.65(1)	(1)8.35–8.9(1)	(1)7.45–8.95(1)	(1)7.45–8.7(1)
Baltimore, barges	(1)8.25–8.8(1)	(1)8.25–8.8(1)	(1)8.25–8.8(1)	(1)7.35–8.8(1)	(1)7.35–7.9(2)
Motor Gasoline, 74-76 oct.					
New York harbor	(2)7.8–9(1)	(2)7.8–9(1)	(1)7.8–8.9(1)	(2)6.9–8.9(1)	(2)6.9–8.9(1)
New York harbor, barges	(2)7.7–8.6(1)	(2)7.7–8.6(1)	(1)7.7–7.9(1)	(2)6.8–7.9(1)	(2)6.8–7.6(1)
Philadelphia	(1)7.8–9(4)	(1)7.8–9(4)	(1)7.8–9(4)	(2)6.9–9(3)	(2)6.9–9(2)
Philadelphia, barges	(1)7.7–7.9(1)	(1)7.7–7.9(1)	(1)7.7–7.9(1)	(2)6.8–7.9(1)	(2)6.8–6.9(1)
Baltimore	(1)7.35–8.4(1)	(1)7.35–8.4(1)	(1)7.35–7.9(1)	(1)6.45–7.9(1)	(1)6.45–7.45(3)
Baltimore, barges	(1)7.25–7.8(1)	(1)7.25–7.8(1)	(1)7.25–7.8(1)	(1)6.35–7.8(1)	(1)6.35–6.9(2)
Motor Gasoline:					
Western Penna. Bradford-Warren:					
74-76 Oct.	(1)7.5–7.75(2)	(1)7.5–7.75(2)	7.75(2)	(1)7.25–7.75(2)	(2)7.25–7.75(1)
Western Penna. Other Districts:					
74-76 Oct.	(1)7.5–8.25(1)	(1)7.5–8.25(1)	(2)7.5–8(1)	(2)7.5–8(1)	(1)7–7.5(1)

NOTE: Gasoline prices are as reported in each day's Platt's OILGRAM Daily Oil Price Service. Figures shown in parentheses with Atlantic Coast & Western Penna. prices indicate number of companies at the high and at the low; figures shown in parentheses with other prices in this summary indicate number of companies quoting when less than three are quoting.

(a) Posting of one supplier quoting the lows at New York, Philadelphia & Baltimore are for Min. 80. Oct. (A. S. T. M.) Ethyl.

At Refineries and Terminals and By Tank Wagon

Prices herewith are reproduced from Platt's *OILGRAM* Daily Oil Price Service, associated with National Petroleum News, whose representatives in all *NPN-OILGRAM* offices devote their time exclusively to reporting oil industry prices everywhere.

Prices shown are actual sales prices, or quotations meaning sellers' general offers or posted prices; for current sales and shipment; for the business day or period stated; except Tank Wagon prices, prices are for bulk lots such as tank car and motor transport; barge or tanker cargo lot prices are identified; FOB refineries or terminals; in cents per gal. except where shown in bbls. of 42 gals.; ex all fees and taxes; for crude oil and its products lawfully produced and transported; reported as received by *OILGRAM* and National Petroleum News but not guaranteed; for subscribers' private use only and not for resale or distribution or publication. For further details of price conditions apply to any *NPN-OILGRAM* office or see back of any *OILGRAM* Price Service invoice.

For complete price service delivered daily from nearest *OILGRAM* publishing office, New York, Cleveland and Tulsa, address Platt's Price Service, Inc., 1213 W. 3rd St., Cleveland (13), Ohio. Annual subscription rate payable in advance $100 per year train mail and $112.50 per year air mail.

Refinery Prices

Gasoline — U. S. Motor (ASTM) octane except where otherwise specified

OKLAHOMA

Prices in Effect	August 5	July 29
78-78.5 oct. Ethyl	7.75–8.25	6.75–8.25 (a)
73-75 oct.	6.75–7	6.7
63-66 oct.	6.625(1)	6.625(1)
60 oct. & below	6.25	5.25–6.25

(a) Effective July 29.

MID-WESTERN (Group 3 basis)

78-78.5 oct. Ethyl	7.75–8.25	6.75–8.25
73-75 oct.	6.75–7	6–7
63-66 oct.	6.375(1)	6.125(1)
60 oct. & below	6–6.25	5.25–6.25

N. TEX. (For shpt. to Tex. & N. M. dest'ns.)

78-78.5 oct. Ethyl	8	7.5–8
73-75 oct.	7	6.5–7
63-66 oct.	6.625(1)	6.625(1)
60 oct. & below	6.25–6.3	5.7–6.25

W. TEX. (For shpt. to Tex. & N. M. dest'ns.)

78-78.5 oct. Ethyl	8	8
73-75 oct.	7	7
63-66 oct.	6.625(2)	6.625(2)
60 oct. & below	6.25	6.25

E. TEX. (Truck Tnspt.)

78-78.5 oct.	8	7.8
73-75 oct.	7	6.7
60 oct. & below	6–6.25	5.25–6.25

CENT. W. TEX. (Prices to truck transports)

78-78.5 oct.	8(2)	8(2)
73-75 oct.	7(2)	7(2)
60 oct. & below	6.25(2)	6.25(2)

KANSAS (For Kansas destinations only)

78-78.5 oct. Ethyl	8.125–8.3	7.2–8.3
73-75 oct.	7.125–7.3	6.2–7.3
63-66 oct.	....	....
60 oct. & below	6.375–6.5	5.5–6.5

ARK. (For shipment to Ark. & La.)

78-78.5 oct. Ethyl	7.875(1)	7(1)
73-75 oct.	6.875(1)	6(1)
60 oct. & below, unleaded	6.125(1)	5.25(1)

WESTERN PENNA.

Bradford-Warren:		
74-76 oct.	(1)7.5–7.75(2)	(2)7.25–7.75(1)
Other districts:		
74-67 oct.	(1)7.5–8.25(1)	(1)7–7.5(1)

Prices in Effect	August 5	July 29
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis; for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor:		
78-78.5 oct.	9.25–10.55	8.25–10.25
73-75 oct.	8.25–9.25	7.25–9.25
Str. run gasoline, excluding Detroit shpt.	6-7	5.5–7

OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances.)

73-75 oct.	9	9

CALIFORNIA

80-82 oct. (Ethyl)	....	8–8.5
74-75 oct.	....	7–7.5

Kerosine, Gas & Fuel Oils

OKLAHOMA

41-43 grav. w.w.	5.375	4.875–5.375
42-44 grav. w.w.	5.5–5.75	5–5.75
Range Oil	5	4.5–5
No. 1 p.w.	4.875–5.125	4.375–5.125
No. 1 straw	4.75(1)	4.75(1)
No. 2 straw	4.625	4.125–4.625
No. 3 fuel	4.5	4–4.5
No. 6 fuel	$1.285–1.33	$1.11–$1.33
14-16 fuel	$1.284(1)	$1.80(1)

MID-WESTERN (Group 3 basis)

41-43 grav. w.w.	5.25–5.375	4.875–5.375
42-44 grav. w.w.	5.5	5–5.5
Range Oil	5	4.5–5
No. 1 p.w.	4.75–4.875	4.375–4.875
No. 2 straw	4.625	4.125–4.625
No. 3	4.375–4.5	4–4.5
No. 6	$1.285–1.39	$1.11–$1.33

N. TEX. (For shpt. to Tex. & N. M. dest'ns.)

41-43 grav. w.w.	5.375–5.4	4.875–5.375
42-44 grav. w.w.	5.5(1)	5.5(1)
No. 1 p.w.	4.875(2)	4.375–4.875
No. 2 straw	4.625(1)	4.625(1)
58 D.I.	5.2(1)	4.55(1)
No. 6 fuel	$1.33–1.38(2)	$1.33–$1.38

W. TEX. (For shpt. to Tex. & N. M. dest'ns.)

No. 2 straw	4.625–4.875	4.625–4.875
No. 6 fuel	$1.38(1)	$1.38(1)

E. TEX. (Truck trnspt.)

41-43 grav. w.w.	5.375–5.875	4.875–5.875
42-44 w.w.	5.5–5.875	4.875–5.875
Range oil	....	....
No. 1 straw	....	....
45 Cet. Diesel	5.75(1)	5.75(1)
No. 2 straw	4.875–5(1)	4.875–5(1)
58 D.I. & above	5–5.75(2)	5.75(1)
No. 6 fuel	$1.18–$1.43	$1.18–$1.43
U.G.I. gas oil	4.5–4.75(2)	3.5–4.75(2)

KANSAS (For Kansas destinations only).

42-44 grav. w.w.	5.625–5.7	5.2–5.7
No. 1 p.w.	5–5.1	4.6–5.1(a)
No. 6 fuel	$1.38(1)	$1.38(1)

(a) Effective July 29.

ARK. (For shipment to Ark. and La.)

42-44 w.w. kero	5.375(1)	5(1)
No. 2	4.5(1)	4.125(1)
No. 3 fuel	4.375(1)	4(1)
Tractor fuel	6(1)	5.5(1)
Diesel fuel 52 & below	4.875(1)	4.5(1)
Diesel fuel 58 & above	5.125(1)	4.75(1)

WESTERN PENNA.

Bradford-Warren:		
45 grav. w.w.	(1)6.75-7.25(1)	(1)6.5-6.55(2)
No. 2 "	6.75(1)	6.25(1)
No. 3 "	(1)6.75-6.95(1)	6.25(1)
36-40 gravity	6.5(1)	6.25(1)
Other districts:		
45 grav. w.w.	(3)7.25–7.425(1)	(6)6.925–7.25(1)
47 grav. w.w.	7.375(3)	9.375(1)
No. 1 fuel	(2)7–7.125(2)	(2)6.625–7(1)
No. 2 "	(3)6.75–7(1)	6.25–6.875(1)
No. 3 "	(1)6.75–6.875(1)	(1)6.25–6.875(1)
36-40 grav.	(1)6.25–6.875(2)	(1)5.75–6.75(1)

Prices in Effect	August 5	July 29
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
44-46 kerosine	6.75(1)	6.75(1)
46-49 gravity w.w.	7	6.3–7
P.W. Distillate	6.5-6.75	6–6.5
No. 2 light straw	6.25(1)	6.25(1)
No. 3 gas oil, Straw	6	5.5–6
U.G.I. gas oil	5.5	5–5.5
Fuel Oils (*Vis. at* 100)		
300-500 Vis.	5.14	4.64–5.14
100-300 Vis.	5.5	5–5.5
OHIO (S. O. Ohio quotations for statewide delivery)		
Kerosine	8	8
CALIFORNIA		
40-43 grav. w.w.	....	....
San Joaquin Valley:		
Heavy fuel	....	$1.25
Light fuel	....	$1.35
Diesel fuel	....	4.75
Stove dist.	....	5.75
Los Angeles:		
Heavy fuel	....	$1.25
Light fuel	....	$1.35
Diesel fuel	....	4–4.75
Stove dist.	....	5.75
San Francisco:		
Heavy fuel	....	$1.30
Light fuel	....	$1.40
Diesel fuel	....	5.25
Stove dist.	....	6.25

NOTE: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

Prices in Effect	August 5	July 29
WESTERN PENNA		

Prices are for sales made, or offers reliably reported, to jobbers & compounders only.

Viscous Neutrals—*No. 3 col. Vis. at* 70° *F.*

200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	39(1)	39(1)
10 p.t.	38(1)	38(1)
15 p.t.	37(1)	37(1)
25 p.t.	....	(1)28–38(1)
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	37(1)	37(1)
10 p.t.	36(1)	36(1)
15 p.t.	35(1)	35(1)
25 p.t.	....	(1)26–36(1)

NOTE: Limited quantity neutrals available to regular trade.

Cylinder Stocks:

Brt. stk., 145-155 *vis. at* 210°, 540-550 fl., *No.* 8 *col.*

10 p.t.	30.5(1)	30.5(1)
15 p.t.	29.5(1)	29.5(1)
25 p.t.	....	(4)25-27.5(1)
600 S.R. filterable	....	(2)15–19(1)
650 S.R.	....	(2)15.5–20(1)
600 fl.	....	(2)16–23(1)
630 fl.	....	(2)17-25(1)

MID-CONTINENT (F. o. b. Tulsa)

Neutral Oils (*Vis. at* 100° *F. to* 10 *P.P.*)

Pale Oils		
Vis. Color		
60-85—No. 2	8.5–9	7.5–8
86-110—No. 2	8.5–9.5	8–8.5(2)
150—No. 3	14–15	13–14
180—No. 3	14.5–15.5	13.5–15
200—No. 3	15–16	14–15
250—No. 3	16.5–17	16–16.5
280—No. 3	18	17
300—No. 3	18.5–19(2)	17.5–18(2)
Red Oils:		
180—No. 5	....	....
200—No. 5	15(1)	14(1)
300—No. 5	17.5(1)	17.5(1)
Bright Stock—*Vis. at* 210°		
200 Vis. D	29(1)	27(1)
150-160 Vis. D:		
0 to 10 p.p.	23–25	23
10 to 25 p.p.	22.5–25	22.5–23
25 to 40 p.p.	25(1)	24(2)
150-160 Vis. E	22(1)	22(1)
120 Vis. D:		
0 to 10 p.p.	24(2)	22(2)
600 S.R. Dark Green	9.5(1)	8.5(1)
600 S.R. Olive Green	12.5–13(2)	10–11(2)

SOUTH TEXAS (Neutral Oils)

Pale Oils (*Vis. at* 100° *F.*)		
Vis. Color		
100 No. 1½-2½	6.5–7.5	6.5
200 No. 2-3	8.75–9.75	8.75
300 No. 2-3	9.25–10.25	9.25
500 No. 2½-3½	10–11	10
750 No. 3-4	10.25–11.25	10.25
1200 No. 3-4	10.375–11.375	10.375
2000 No. 4	10.5–11.5	10.5

(Continued on next page)

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting

Refinery Prices—Continued

Prices in Effect	August 5	July 29
Red Oils:		
100 No. 5-6	6.5–7.5	6.5(2)
200 No. 5-6	8.75–9.75	8.75
300 No. 5-6	9.25–10.25	9.25
500 No. 5-6	10–11	10
750 No. 5-6	10.25–11.25	10.25
1200 No. 5-6	10.375–11.375	10.375
2000 No. 5-6	10.5–11.5	10.5

CHICAGO (From Mid-Continent p.l. crude) Neutral oils *vis. at* 100° *F. 0 to* 10 *p.p.*

Pale Oils:		
Vis. Color		
60-85—No. 2	9.5	9.5
86-100—No. 2	10(1)	10(1)
150—No. 3	15.5(1)	14.5(1)
180—No. 3	16(1)	15(1)
200—No. 3	16(1)	15(1)
250—No. 3	17(1)	16(1)
Red Oils:		
180—No. 5	16(1)	15(1)
200—No. 5	16(1)	15(1)
250—No. 5	17(1)	16(1)
280—No. 5	18(1)	17(1)
300—No. 5	18.5(1)	17.5(1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined (*Viscosity at* 210°)		
140	11.5(1)	11.5(1)
160	12.5(1)	12.5(1)
200	13.5(1)	13.5(1)
Bright stocks, 160 *vis. at* 210 *No.* 8 *color:*		
0 to 10 p.p.	24(1)	24(1)
15 to 25 p.p.	23.5(1)	23.5(1)
30 to 40 p.p.	21.5(1)	21.5(1)
E filtered Cyl. Stock	15.5(1)	15.5(1)

Note: To obtain prices delivered in Chicago add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight Basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	4(Sales)	3.75(Quotes)
FOB BRECKENRIDGE		
Grade 26-70	3.5(Quotes)	3.25(Quotes)
CALIFORNIA (FOB plants in Los Angeles basin)		
21-21.9 pound vapor pressure for blending		4.71–4.85(1)

Naphthas and Solvents

(*FOB Group* 3)		
Stoddard solvent	6.625–7.625	6.625–7.625(a)
Cleaners' naphtha	7.125–8.125	7.125–8.125(a)
V.M.&P. naphtha	7.125–8.125	7.125–8.125(a)
Mineral spirits	6.125–7.125	6.125–7.125(a)
Rubber solvent	7.125–8.125	7.125–8.1(a)
Lacquer diluent	7.375–9.125	7.375–9.125(a)
Benzol diluent	7.875-9.625	7.875-8.625(2&a)

(a) Correct on & since July 29; shown incorrectly in NPN of July 31.

WESTERN PENNA.		
Other Districts:		
Untreated naphtha		7.25(1)
Stoddard solvent	(1)7.5–7.75(1)	(1)7.5–7.75(1)

OHIO (S. O. quotations for statewide delivery); V.M.&P. naphtha, D.C. naphtha, Varnolene & Sohio solvent 9.5 9.5; Rubber solvent 9 9

E. TEXAS (Truck Tnspt.)		
Stoddard Solvent	8(2)	8

Wax

WESTERN PENNA. (Bbls. C.L.)		
White Crude Scale:		
122-124 A.m.p.		(1)4.25–5.25(1)
124-126 A.m.p.	5.25(1)	(2)4.25–5.25(1)

MID-CONTINENT (C.L. FOB Refinery)

Semi-refined:		
132-134 AMP, bbls.	5.75(1)	5.25(1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose, 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)

Snow White	6.5–7.75(2)	6.5–9.5
Lily White	5.75–6.5(2)	5.75–8.5
Cream White	5–5.75(2)	5–7.875
Light Amber	3.625–5(2)	3.625–5.75
Amber	3.375–4.75(2)	3.375–5.5
Red	4.625(1)	3.5–4.375

Tank Wagon Prices

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes**; *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect August 5,* **1946** *as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

ATLANTIC REFINING

	Atlantic White Flash (*Regular Grade*) °Commercial T.W.	°Dealer T.W.	Gasoline Taxes	°Kerosine T.W.
Philadelphia, Pa	10.0	10.0	5.5	11.75
Pittsburgh	10.5	10.5	5.5	12.1
Allentown	10.3	10.3	5.5	12.1
Erie	10.5	10.5	5.5	12.1
Scranton	10.5	10.5	5.5	12.1
Altoona	10.5	10.5	5.5	12.1
Emporium	10.5	10.5	5.5	12.1
Indiana	10.5	10.5	5.5	12.1
Uniontown	10.5	10.5	5.5	12.1
Harrisburg	10.3	10.3	5.5	12.1
Williamsport	10.5	10.5	5.5	12.1
Dover, Del	10.5	10.5	5.5	12.1
Wilmington, Del	10.0	10.0	5.5	11.6
Boston, Mass	....	10.1	4.5	....
Springfield, Mass	....	11.0	4.5	....
Worcester, Mass	....	10.7	4.5	....
Fall River, Mass	....	10.2	4.5	....
Hartford, Conn	....	10.8	4.5	....
New Haven, Conn	....	10.2	4.5	....
Providence, R. I	....	10.2	4.5	....
**Atlantic City	....	9.7	4.5	9.6
**Camden, N. J	....	9.7	4.5	9.6
**Trenton, N. J	....	9.7	4.5	9.6
**Annapolis, Md	....	9.05	5.5	9.8
**Baltimore, Md	....	9.4	5.5	9.4
**Hagerstown, Md	....	10.1	5.5	9.9
**Richmond, Va	....	9.4	7.5	11.9
**Wilmington, N. C	....	9.8	7.5	11.5
**Brunswick, Ga	....	10.25	7.5	*10.7
**Jacksonville, Fla	....	10.25	8.5	11.7

	°Mineral Spirits T.W.†	°V.M.&P. T.W.†
Philadelphia, Pa	11.5	13.0
Lancaster, Pa	12.5	14.0
Pittsburgh, Pa	13.0	14.0

FUEL OILS—T.W.

	°1	°2	°3	°5	°6
Phila., Pa	9.6	8.5	8.5	6.13	5.42
Allentown, Pa	10.1	8.8	8.8	....	....
Wilmington, Del	9.6	8.5	8.5	....	....
Springfield, Mass	....	9.1	9.1	....	....
Worcester, Mass	....	9.1	9.1	....	....
Hartford, Conn	....	8.9	8.9	....	....

*Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

°Effective July 30, 1946.

**Effective Aug. 2, 1945.

CONT'L OIL

	°Conoco N-tane (regular) †Tank Wagon	°Demand (3rd Grade) Wagon	Gasoline Taxes	°Kerosine T.W.
Denver, Col	11	10	5.5	12
Grand Junc., Col	13.5	12.5	5.5	13.5
Pueblo, Col	10.5	9.5	5.5	10.5
Casper, Wyo	12.5	11.5	5.5	13
Cheyenne, Wyo	11	10	5.5	10
Billings, Mont	13	12	6.5	13.5
Butte, Mont	12.5	11.5	6.5	14.5
Great Falls, Mont	13	12	6.5	13.5
Helena, Mont	13	12	6.5	14
Salt Lake City, Utah	14.5	13.5	5.5	15.5
Twin Falls, Ida	15.5	14.5	7.5	18
Albuquerque, N. M.	11.5	10.5	*7	10.5
Roswell, N. M.	11	10	*7	8
Santa Fe, N. M.	11.5	10.5	*7.5	11
Ft. Smith, Ark	10	7.25	8	9.1
Texarkana, Ark	9.7	8.2	*5.5	8
Muskogee, Okla	8.75	7.75	9	9
Oklahoma City, Okla	9	8	9	9
Tulsa, Okla	9	8	9	9

° Effective July 30.

***Taxes:** In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c, Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.

†To consumers & dealers.

HUMBLE OIL

	°Humble (*Regular*) *Tank Wagon	°Retail	Thriftane (*3rd Grade*) °*Tank Wagon	°Retail	Gasoline Taxes
Dallas, Tex	9.5	13.5	8.5	11.5	5.5
Ft. Worth	9.5	13.5	8.5	11.5	5.5
Houston	9.5	13.5	8.5	11.5	5.5
San Antonio	9.5	13.5	8.5	11.5	5.5

	°Kerosine *Tank Wagon	Retail
Dallas, Tex	8	11
Ft. Worth, Tex	8	12
Houston, Tex	9	12
San Antonio, Tex	8	11

*To all classes of dealers & consumers.

°Effective Aug. 1.

Canada

PRICES OF IMPERIAL OIL, LTD.
Per Imperial Gallon, which is 1.2 U. S. Gallons

IMPERIAL OIL

	Esso Gasoline (*Regular Grade*) †Gasoline T.W.	*Gasoline Taxes	Kerosine T.W.
Hamilton, Ont	16.5	11	18
Toronto, Ont	16.5	11	18
Brandon, Man	21.5	10	23.5
Winnipeg, Man	20.0	10	22
Regina, Sask	19.5	11	21.5
Saskatoon, Sask	22.3	11	24.3
Edmonton, Alta	20.4	10	22.4
Calgary, Alta	17.5	10	19.5
Vancouver, B. C.	15	10	24
Montreal, Que	16.5	11	17.5
St John, N. B	16	13	19
Halifax, N. S	16	13	19

*Includes 3c Federal, and Provincial taxes.

†To divided & undivided dealers.

SOCONY VACUUM

	Socony Mobilgas (*Regular Grade*) Com. Cons. T.W.	Undiv. Dlr. T.W.	Gasoline Taxes
New York City			
Manhattan & Bronx	9.8	10.3	*5.5
Kings & Queens	9.8	10.3	*5.5
Richmond	9.4	9.9	*5.5
Albany, N. Y.	9.6	10.1	5.5
Binghamton, N. Y	10.7	11.2	5.5
Buffalo	9.9	10.4	5.5
Jamestown, N. Y	10.1	10.6	5.5
Mt. Vernon, N. Y	9.8	10.3	5.5
Plattsburg, N. Y	10.7	11.2	5.5
Rochester, N. Y	10.5	11.0	5.5
Syracuse, N. Y	10.2	10.7	5.5
Bridgeport, Conn	9.7	10.2	4.5
Danbury, Conn	10.2	10.7	4.5
Hartford, Conn	10.3	10.8	4.5
New Haven, Conn	9.7	10.2	4.5
Bangor, Me	10.4	10.9	5.5
Portland, Me	10.0	10.5	5.5
Boston, Mass	9.6	10.1	4.5
Concord, N. H	11.1	11.6	5.5
Lancaster, N. H	11.7	12.2	5.5
Manchester, N. H	11.0	11.5	5.5
Providence, R. I	9.7	10.2	4.5
Burlington, Vt	10.6	11.1	5.5
Rutland, Vt	10.7	11.2	5.5

	°Mineral Spirits T.W.	°V.M.&P. T.W.
Buffalo, N. Y	11.0	12.2
New York City	11.5	12.5
Rochester, N. Y	12.0	13.5
Syracuse, N. Y	12.7	16.9
Boston, Mass	12.5	13.5
Bridgeport, Conn	16.8	17.8
Hartford, Conn	16.8	17.8
Providence, R. I	13.5	14.5

	Kerosine Yard	T.W.	Mobilfuel Diesel T.C.	T.W.	Mobilheat Fuel Yard	T.W.
New York City						
Manhat'n &:						
Bronx	7.2	10.0	....	9.0	6.8	8.7
Kings & Queens	7.2	10.0	....	9.0	6.8	8.7
Richmond	7.2	10.0	....	....	6.8	8.7
Albany	7.2	9.5	6.3	9.0	6.7	8.7
Binghamton	8.6	10.9	....	10.4	8.1	9.9
Buffalo	8.3	10.6	7.7	10.0	7.9	9.7
Jamestown	8.4	10.7	....	10.3	8.0	9.7
Mt. Vernon	7.3	10.0	....	9.1	6.9	8.7
Plattsburg	7.8	10.1	....	9.6	7.3	9.1
Rochester	8.4	10.7	7.6	9.9	7.6	9.4
Syracuse	8.2	10.5	7.5	9.8	7.5	9.3
Conn.:						
Bridgeport	7.5	10.0	....	9.2	7.0	8.7
Danbury	7.9	10.5	....	....	7.5	8.2
Hartford	7.7	10.2	....	9.2	7.1	8.9
New Haven	7.0	10.0	6.7	9.0	6.6	8.7
Maine:						
Bangor	7.6	10.0	7.1	9.4	7.1	8.8
Portland	7.2	9.9	6.5	9.0	6.7	8.7

Tank Wagon Prices—Continued

	Kerosine Yard	Kerosine T.W.	Mobilfuel Diesel T.C.	Mobilfuel Diesel T.W.	Mobilheat Fuel Yard	Mobilheat Fuel T.W.
Mass.:						
Boston	7.5	10.3	6.5	9.0	6.9	8.8
N.H.:						
Concord	8.1	10.4	...	10.3	8.0	9.8
Lancaster	9.2	11.5	...	11.2	8.9	10.7
Manchester	8.2	10.8	...	10.0	7.7	9.5
R. I.:						
Providence	7.5	10.0	6.5	9.0	6.9	8.8
Vermont:						
Burlington	7.8	10.1	7.2	9.5	7.2	8.9
Rutland	8.0	10.3	...	9.7	7.4	9.2

°Effective August 5.

*Does not include 2% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels.

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

S. O. CAL.

	—CHEVRON— °(Regular) T.T.	°Av. 80 Retail	°Av. 80 T.T.	Gasoline Taxes	°Kerosine T.W.
San Francisco, Cal.	11	15	14.5	4.5	13.25
Los Angeles, Cal.	10.5	14.5	14	4.5	11.75
Fresno, Cal.	12	16	15.5	4.5	14.25
Phoenix, Ariz.	13	17	16.5	6.5	14.25
Reno, Nev.	13	17	16.5	5.5	15.25
Portland, Ore.	11.5	15.5	15	6.5	15.25
Seattle, Wash.	11.5	15.5	15	6.5	15.25
Spokane, Wash.	13.5	17.5	17	6.5	18.25
Tacoma, Wash.	11.5	15.5	15	6.5	15.25
Boise, Idaho	14.5	18.5	18	7.5	18.0

Resale and Commercial Gasoline—Tank car deliveries of Chevron Aviation 80, unleaded, and Chevron Gasoline .25c per gallon below posted net tank truck price. Pearl Oil (The Standard Kerosine):—Tank car deliveries 3c below posted tank truck price.

°Effective Aug. 1.

S. O. IND.

	Red Crown (Reg Grade) Blue Crown (3rd Grade) °Red Cr'n. Cons. T.W.	°Red Cr'n. Dlr. T.W.	°Blue Cr'n. Dlr. T.W.	Gasoline *Taxes	°Kerosine T.W.
Chicago, Ill.	13.0	11.0	10.3	4.5	11.7
Decatur, Ill.	12.7	10.7	9.8	4.5	11.4
Joliet, Ill.	13.0	11.4	10.3	4.5	11.7
Peoria, Ill.	12.8	11.0	10.8	4.5	11.5
Indianapolis, Ind.	12.7	11.2	....	5.5	11.2
Evansville, Ind.	12.5	11.0	9.7	5.5	11.0
South Bend, Ind.	13.2	11.7	11.2	5.5	11.7
Detroit, Mich.	12.4	10.9	....	4.5	10.9
Grand Rapids, Mich.	12.4	10.9	....	4.5	10.9
Saginaw, Mich.	12.4	10.9	....	4.5	10.9
Green Bay, Wisc.	13.3	11.8	11.3	5.5	12.0
Milwaukee, Wis.	13.2	11.7	11.2	5.5	11.9
La Crosse, Wisc.	13.1	11.6	11.1	5.5	11.8
Minneapolis - St. Paul	13.1	10.1	11.1	5.5	11.8
Duluth, Minn.	13.3	11.8	....	5.5	12.0
Mankato, Minn.	13.1	11.6	11.1	5.5	11.8
Des Moines, Ia.	12.6	11.1	10.6	5.5	11.3
Mason City, Ia.	12.9	11.4	10.9	5.5	11.6
St. Louis, Mo.	12.2	10.7	10.5	4.5	11.3
Kansas City, Mo.	12.0	10.5	9.6	4.5	10.7
St. Joseph, Mo.	12.2	10.7	10.5	4.5	11.3
Fargo, N. D.	14.1	12.6	12.1	5.5	12.8
Huron, S. D.	13.5	12.0	11.5	5.5	12.2
Wichita, Kans.	11.4	9.9	8.3	5.5	10.1
Omaha, Neb.	12.6	10.8	10.6	6.5	11.3

Stanavo Ethyl Aviation Number 73

	Cons. T.W.	*Taxes
Detroit, Mich.	°17.3	4.5
Fargo, N. D.	°16.6	5.5
Huron, S. D.	°16.0	5.5
Indianapolis, Ind.	°15.6	5.5
Kansas City, Mo.	°14.5	4.5

	°Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
(Prices are base prices before discounts)				
Chicago	14.6	14.9	13.9	4.5
Detroit	17.1	16.3	17.6	4.5
K. C., Mo.	14.3	15.3	14.8	1.5
St. Louis, Mo.	14.9	15.9	14.4	1.5
Milwaukee	15.5	16.5	16.0	5.5
Minneap'ls	15.4	16.4	14.7	5.5

Fuel Oils T.W. Chicago	°Standard Heater Oil	°Stanolex Furnace Oil
1-99 gals.	10.2	9.7
100-149 gals.	9.2	8.7
150 gals. & over	8.7	...
150-399 gals.	...	8.7
400 gals. & over	...	8.2

	Stanolex Fuel A	Stanolex Fuel C
1-749 gals.	7.0	6.2
750 gals. & over	6.25	5.45

Stanolex Furnace Oil

Other Points	°1-99 gals.	°100 gals. & over
Indianapolis	9.5	8.5
Detroit	9.5	8.5
Milwaukee	9.8	8.8
Minneapolis	9.4	8.4
St. Louis	9.2	8.2
Kansas City	8.8	7.8

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph and St. Louis, 1c. Iowa kerosine prices are ex 4c state tax. In naphtha tax column are included 1.5c federal tax and state taxes. State sales, occupation, consumer and use taxes to be added where applicable.

°Effective July 30, 1946.

Crown Gasoline (Regular)

S. O. KY.

	°†Crown Net Dealer	Gasoline Taxes	°Kerosine T.W.
Covington, Ky.	10.5	6.5	10.5
Lexington, Ky.	11.5	6.5	10.5
Louisville, Ky.	11.0	6.5	10.0
Paducah, Ky.	11.0	6.5	10.0
Jackson, Miss.	10.5	7.5	9.4
Vicksburg, Miss.	10.25	7.5	9.1
Birmingham, Ala.	10.75	*8.5	10.1
Mobile, Ala.	9.75	*9.5	9.6
Montgomery, Ala.	10.75	*9.5	10.1
Atlanta, Ga.	11.25	7.5	10.5
Augusta, Ga.	11.25	7.5	10.2
Macon, Ga.	11.25	7.5	10.5
Savannah, Ga.	10.25	7.5	9.7
Jacksonville, Fla.	10.25	8.5	9.7
Miami, Fla.	10.25	8.5	9.7
Pensacola, Fla.	9.75	*9.5	9.1
Tampa, Fla.	10.25	8.5	9.7

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city, Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, included in above prices.

†Consumer t.w. prices are same as net dealer prices.

°Effective Aug. 2.

S. O. N. J.

	Esso (Regular Grade) °Consumer Tank Wagon	°Dealer T.W.	Gasoline Taxes	°Kerosine T.W.
Atlantic City, N. J.	9.70	10.20	4.5	9.6
Newark	9.70	10.20	4.5	9.6
Annapolis, Md.	9.40	9.55	5.5	...
Baltimore	10.70	9.90	5.5	9.4
Cumberland	9.70	11.20	5.5	10.9
Washington, D. C.	10.20	10.20	4.5	9.9
Danville, Va.	9.65	10.70	7.5	9.7
Petersburg	9.30	10.15	7.5	9.9
Norfolk	9.40	9.80	7.5	9.6
Richmond	10.80	9.90	7.5	9.9
Roanoke	10.90	11.30	7.5	10.0
Charleston, W. Va.	10.65	11.40	6.5	11.1
Parkersburg	10.85	11.15	6.5	10.8
Wheeling	10.30	11.35	6.5	11.4
Charlotte, N. C.	10.70	10.80	7.5	10.2
Hickory	10.90	11.20	7.5	10.6
Mt. Airy	10.60	11.40	7.5	10.4
Raleigh	10.40	11.10	7.5	10.6
Salisbury	9.90	10.90	7.5	11.6
Charleston, S. C.	10.80	10.40	7.5	9.3
Columbia	10.30	11.30	7.5	10.2
Spartanburg	9.00	10.80	7.5	9.7
New Orleans, La.	8.90	9.50	8.5	8.1
Baton Rouge	9.40	9.40	8.5	8.6
Alexandria	8.90	9.90	8.5	8.6
Lake Charles	8.70	9.40	8.5	10.1
Shreveport	9.70	9.20	8.5	7.1
New Iberia, La.	10.60	10.20	8.5	8.1
Knoxville, Tenn.	9.90	11.10	8.5	11.0
Memphis	10.50	10.40	8.5	9.6
Chattanooga	11.00	11.00	8.5	10.1
Nashville	10.50	11.50	8.5	9.1
Bristol	10.20	11.00	8.5	11.1
Little Rock, Ark.	10.70	8.0	11.0	

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	°No. 1	°No. 2
Atlantic City, N. J.	9.6	8.6
Newark	9.6	8.6
Baltimore, Md.	9.4	8.6
Washington, D. C.	9.9	9.0
Norfolk, Va.	9.6	8.4
Petersburg	9.9	8.6
Richmond	9.9	8.6
Charlotte, N. C.	10.2	9.4
Hickory	10.6	9.6
Raleigh	10.6	9.7
Charleston, S. C.	9.3	8.0
Columbia	10.2	9.0
Spartanburg	9.7	9.8

*Does not include 1c Louisiana kerosine tax Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—In South Carolina 1c per gal. off posted t.w. price for 25 gals. or more. In Arkansas 2c per gal. off posted t.w. price.

Naphtha—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

°Effective Aug. 1, 1946.

S. O. OHIO

	Sohio X-70 Gasoline** (Regular Grade) Consumer T.W.	Reselers	†S.S.	Gasoline Taxes	Kerosine T.W.
Ohio, Statewide	13	11	14.5	5.5	10.3
Akron	13	10.5	13.5	5.5	10.3
Canton	13	10.5	13.5	5.5	10.3
Cincinnati	13	10.5	13.5	5.5	10.3
Cleveland	13	10.5	13.5	5.5	10.3
Columbus	13	10.5	13.5	5.5	10.3
Dayton	13	10.5	13.5	5.5	10.3
Lima	13	10.5	13.5	5.5	10.3
Mansfield	13	10.5	13.5	5.5	10.3
Marion	13	10.0	13.0	5.5	10.3
Portsmouth	13	10.5	13.5	5.5	10.3
Toledo	13	10.5	13.5	5.5	10.3
Youngstown	13	10.5	13.5	5.5	10.3
Zanesville	13	10.5	13.5	5.5	10.3

Aviation Gasoline—Statewide

	Consumer Gasoline T.W.	Taxes
Sohio Aviation Gasoline Clear Spc. AN-F 22, Amend. 1	15.5	5.5
Esso (Clear) Avia. Grade 80	17.5	5.5
Esso Aviation Grade 91/98	18.5	5.5
Esso Aviation Grade 100/130	21.5	5.5

Naphtha—T.W.

	Statewide
S.R. Solvent	14.5
D.C. Naphtha	15
V.M.&P. Naphtha	15
Varnolene	15
Sohio Solvent	15

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	9.3	9.3	8.8	°8.55

°Effective July 27.

**Renown (third-grade) prices are same as X-70 unless otherwise noted.

†Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

*For Cleveland area only. Full compartment hose dumps.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price, 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals. or over, 1.5c.

TEXAS CO.

	Gasoline—Dealer T.W. Fire-Chief (Regular)	Indian (3rd Grade)	Gasoline Taxes
Dallas, Tex.	9.5	8.5	5.5
Ft. Worth, Tex.	9.5	8.5	5.5
Wichita Falls, Tex	9.5	8.5	5.5
Amarillo, Tex.	9.5	8.5	5.5
Tyler, Tex.	9.5	8.5	5.5
El Paso, Tex.	12.0	11.5	5.5
San Angelo, Tex.	9.5	8.5	5.5
Waco, Tex.	9.5	8.5	5.5
Austin, Tex.	9.5	8.5	5.5
Houston, Tex.	9.5	8.5	5.5
San Antonio, Tex.	9.5	8.5	5.5
Port Arthur, Tex.	9.5	8.5	5.5

° Effective July 30.

Notice

Tank Wagon prices include inspection fees on both gasoline and kerosine unless otherwise specified per gallon as follows:

Ala. 1/40c on gasoline; Ark. 1/20c; Fl. 1/8c; Ill. 3/100c; Ind. 2/25c; Kans. 1/50c; La. 1/32c; Minn. 7/200c; Neb. 2/100c; Nev. 1/20c; N. C. 1/4c; N. Da. 1/20c; Okla. 2/25c; S. Car. 1/8c; S. Da. 1/40c; Tenn. 2/5c; and Wisc. 3/100c.

Kerosine inspection fees only: Ala. 1/2c; Fla. 1/8c; Iowa 3/50c; Mich. 1/5c per gal.

Atlantic Coast

Seaboard Export Coastwise Prices

(Prices are of refiners, FOB their refineries and tanker terminals, and of tanker terminal operators FOB their terminals)—Prices in Effect August 5

	MOTOR GASOLINE (ASTM Octane)		KEROSINE & FUEL OILS				
District	74-76 Oct.	78-78.5 Oct.	KEROSINE &/OR NO. 1 FUEL	NO. 2 FUEL	NO. 3 FUEL	No. 5	No. 6
N. Y. Harb..	(2)7.8–9(1)	(2)8.8–10.4(1)	(7)6.7–6.8(4)	(6)6.3–6.4(4)	6.4(1)	(2)2.00–2.29(2)	(6)1.92–2.02(3)
N. Y. Harb., barges.....	(2)7.7–8.6(1)	(2)8.7–8.9(1)	(5)6.6–6.7(4)	(6)6.2–6.3(4)	6.3(1)	....	....
Albany.....	(6)9–9.05(1)	(1)10.05–10.5(2)	7(8)	6.5(6)	6.5(1)	....	2.22(1)
Philadelphia.	(1)7.8–9(4)	(1)8.8–10.25(1)	(9)6.7–7.1(1)	(7)6.2–6.6(1)	....	(1)2.23–2.28(1)	(1)1.92–2.07(1)
Phila., barges	(1)7.7–7.9(1)	(1)8.7–8.9(1)	....	....	....	....	....
Baltimore...	(1)7.35–8.4(1)	(1)8.35–9.65(1)	(5)6.8–7.1(1)	(4)6.3–6.6(1)	....	2.00(1)	(2)1.92–2.07(1
Balt., barges	(1)7.25–7.8(1)	(1)8.25–8.8(1)	....	....	....	....	....
Norfolk....	(1)7.35–8(1)	(1)8.35–9.25(1)	(1)6.6–6.725(1)	(3)6.3–6.325(1)	....	1.96(1)	(2)1.88–1.93(1)
Wilm., N. C.	(2)7.15–8.35(1)	(2)8.15–9.25(1)	(7)6.65–6.675(1)	(6)6.3–6.325(1)	....	....	....
Charleston...	(1)7.15–8(1)	(1)8.15–9.25(1)	6.8(3)	6.3(2)	....	1.91(1)	1.83(2)
Savannah....	(5)8–8.37(1)	9(3)	(1)6.65–6.7(2)	(1)5.875–6.2(2)	....	....	1.88(1)
Jacksonville..	(4)8–8.37(1)	9(3)	(1)6.675–6.7(3)	(1)5.85–6.2(3)	....	....	(1)1.63–1.83(1)
Miami.....	(3)8–8.37(1)	9(3)	(1)6.675–6.7(1)	6.2(1)	....	....	....
Tampa.....	(4)8–8.37(1)	9(4)	(1)6.65–6.7(2)	(1)5.875–6.2(3)	....	....	(1)1.73–1.74(1)
Pensacola....	8(1)	....	5.925(1)	5.875(1)	....	....	....
Mobile.....	(1)7.5–7.87(1)	....	(1)5.875–6(1)	....	....	....	....
New Orleans.	(2)6.875–7.25(1)	(2)7.5–8.25(1)	(1)5.35–5.375(2)	4.875(2)	....	1.46(1)	(2)1.38–1.43(1)
Portland....	9.2(5)	(1)10.45–10.7(1)	7(8)	6.5(7)	6.5(1)	2.545(1)	(1)2.015–2.065(2
Boston.....	(2)8.29–9.1(5)	(2)9.2–10.6(1)	6.9(9)	6.5(8)	6.5(1)	(1)2.145–2.245(2)	(1)1.965–2.065(2)
Providence..	9.1(6)	(1)10.35–10.6(1)	6.9(9)	6.5(7)	6.5(1)	2.165(2)	(1)1.985–2.035(2)
New Haven..	....	....	....	....	....	....	....

(a) Prices are for straight-run low pour test No. 5.
(b) Postings of one supplier quoting the lows at New York, Philadelphia & Baltimore are for Min. 80 Oct. (A. S. T. M.) Ethyl.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ship's bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	(3)$1.92–2.02(2)	(2)$2.61–2.66(1)	6.3(1)	(1)6.4–6.5(1)
Albany.....	$2.22(1)	$2.82(1)	6.5(1)	6.7(1)
Philadelphia.	(1)$1.92–2.02(3)	(1)$2.61–2.66(1)	....	6.2(1)
Baltimore...	(1)$1.92–1.97(1)	$2.61(1)	6.3(1)	6.3(1)
Norfolk.....	(2)$1.88–1.93(1)	$2.61(1)	6.3(1)	6.3(1)
Charleston...	$1.83(2)	$2.61(1)	6.3(1)	....
Savannah....	$1.88(1)	....	....	....
Jacksonville..	(1)$1.63–1.83(1)	....	....	....
Tampa.....	(1)$1.73–1.74(1)	....	....	....
New Orleans.	(2)$1.38–1.43(1)	....	5.25(1	5(1)
Portland....	(1)$2.015–2.065(2)	....	6.5(1)	6.6(1)
Boston.....	(1)$1.965–2.065(2)	$2.69(1)	6.5(2)	6.6(1)
Providence...	(1)$1.985–2.035(2)	$2.702(1)	6.5(1)	6.6(1)
New Haven..	....	....	....	....

Gulf Coast

Prices in Effect August 5

	New Orleans & Lower Mississippi to Baton Rouge Tank Cars	New Orleans & Lower Mississippi to Baton Rouge Barges	Texas Gulf Coast South of New Orleans Tank Cars	Texas Gulf Coast South of New Orleans Barges	CARGOES Domestic & Export From all Gulf Ports
MOTOR GASOLINE					
78-78.5 Oct. Ethyl	7.5(2)	7.25(2)	8(1)	(1)7.25-7.75(1)	(1)7.25-7.75(2)
74-76 Oct.....	6.625(2)	6.375(2)	7(2)	(3)6.75-7(1)	(1)6.625-6.75(4)
70-72 Oct.....	....	....	....	....	(1)6.375-6.625(2)
Unleaded (ASTM Oct.)					
70 Oct.....	....	....	....	....	(1)6.375-6.625(1)
68 Oct.....	....	....	....	....	(1)6.375-6.5(1)
65 Oct.....	6.375(2)	6.375(2)	....	....	6(1)
60 Oct.....	....	....	....	....	.....
KEROSINE & LIGHT FUELS					
41-43 w.w. kero...	5.375(2)	(1)5.25-5.375(1)	(1)5.225-5.5(1)	(1)5.225-5.375(1)	(2)5.25-5.625(1)
42-44 w.w. kero...	....	....	....	....	5.25(1)
No. 2 fuel oil.....	4.875(2)	4.875(2)	(1)4.85-5.25(1)	(1)4.85-5(2)	(3)4.875-5(2)
DIESEL & GAS OILS (In diesel index No.)					
No. 5 fuel oil.....	....	....	....	....	$1.55(1)
43-47 di.....	....	....	....	5.25(1)	(1)5.125-5.25(1)
48-52 di.....	5.125(1)	....	....	5.25(1)	(3)5.125-5.25(1)
53-57 di.....	5.25(2)	5.125(1)	....	5.25(1)	(1)5.125-5.25(2
58 and above.....	....	....	....	....	5.375(1)

HEAVY FUELS & BUNKER OIL (all Gulf Ports) Heavy Diesels	In Cargoes	In Ship's Bunkers (Ex Lighterage)
Below 28 API Grav.....	....	....
28 & above API Grav.....	....	2.11(1)
Bunker C Oil	(1)$1.38-1.48(2)	(2)$1.38-1.60(2)

TANKER RATES

Approximate rates, cents per bbl.: Gulf-N. Atlantic, not east of New York

Heavy crude & fuel, 10-19.9 grav....	43.8
Light crude, 30 grav. or lighter.....	39
Gasoline.....	32.9
Kerosine.....	36
No. 2 fuel.....	38

Mid-Continent Lubes

(At Gulf; in packages, FAS. New Orleans; in bulk, FOB terminals).

Prices in Effect August 5

Bright Stock	Steel Drums	Bulk
D color, Vis at 210°		
150 vis., 0-10 p.p.	34.05(1&a)	25.05(1)

(a)FAS at New Orleans.

Pacific Coast

(In Ships' Bunkers, or Deep Tank Lots)

	Prices in Effect Aug. 5 Diesel Fuel (P.S. 200)	Bunker C Fuel (P.S. 400)
San Pedro, Calif.	$1.765	$1.25
San Francisco, Calif.	1.815	1.30
Portland, Ore.	2.015	1.45
Seattle, Wash.	2.015	1.45

NOTE: In Atlantic & Gulf Coast price tables, figures in parentheses indicate number of companies at the high and at the low. In other tables on this page, figures in parentheses indicate number of companies quoting when less than three are quoting.

Wax

(Melting points are AMP, 3° higher than EMP. Prices are FOB refinery and do not include bag, freight or export differentials).

Prices in Effect August 5

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25(1)	....	4.25(1)
122-4 White.	....	....	....
124-6 White.	4.25(1)	4.75-5.25(2)	4.25-5.25(2)
Fully Refined:			
123-5.....	5.2(1)	5.2(2)	5.2(1)
125-7.....	5.2(1)	5.2(2)	5.2(2)
128-30....	5.6(1)	5.6	5.6(1)
130-32....	5.85(1)	5.85(2)	5.85(1)
133-5.....	6.15(1)	6.15	6.15(2)
135-7.....	6.4(1)	6.4(1)	6.4(1)

Naphtha

Effective August 5

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor.	11.5(2)	10–10.5
Philadelphia.....	11.5(2)	10.5
Baltimore.....	11(2)	9.5–10
Boston.....	12(2)	11
Providence.....	12(1)	11(2)

Export Prices

Prices in Effect August 5

	Mexican Gulf Ports U. S. Dollars per Bbl Bunker C (Ships' Bunkers)	Diesel (Ships' Bunkers)
Tampico.....	°$1.38	°$2.11
Veracruz.....	° 1.38	° 2.11
Minatitlan.....	° 1.38	° 2.11

°Effective August 1.

	Pacific Coast	
Guaymas.....	$1.65	$3.22
Mazatlan.....	1.65*	3.22
Acapulco.....	1.65	2.89
Manzanillo.....	1.65	2.89
Salina Cruz.....	1.65	2.89

Note: All bunkers sales subject to Mexican stamp tax of 1.65% ad valorem.

*Port accessible only for small vessels drawing 14 to 15 feet.
°Effective August 1.

NPN Gasoline Index

	Dealer T.W.	Tank Car
	Cents Per Gal.	
Aug. 5.....	10.93	7.21
Month ago.....	9.87	6.47
Year ago.....	10.34	6.72

Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

Prices in $ per bbl. of 42 U. S. gals. at the well.

Mid-Continent, Texas-New Mexico, Louisiana-Arkansas, Rocky Mountain and Other Fields

(See below for companies posting)

SCHEDULE Gravity	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Below 14	....	$0.99	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$1.31	....	....	....
14-14.9	....	1.02	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
15-15.9	....	1.05	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
16-16.9	....	1.08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
17-17.9	....	1.11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Below 18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
18-18.9	....	1.14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1.35	....	....	$1.925
19-19.9	....	1.17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1.33	....	....	0.950
Below 20	$1.18	....	$1.29	$1.05	$1.11	$1.41	....	$1.43	$1.38	$1.33	$1.28	$1.15	$1.09	$1.16	$1.23	$1.28	....	....	....	....
20-20.9	1.20	1.20	1.22	1.07	1.13	1.43	$1.32	1.45	1.40	1.35	1.30	1.17	1.11	1.18	1.25	1.30	1.40	....	....	0.975
Below 21	1.20	....	....	1.07	....	1.43	....	1.45	....	....	1.30	....	....	....	....	....	....	....	$1.10	....
21-21.9	1.22	1.22	1.24	1.09	1.15	1.45	1.34	1.47	1.42	1.37	1.32	1.19	1.13	1.20	1.27	1.32	1.42	....	1.12	1.00
22-22.9	1.24	1.24	1.26	1.11	1.17	1.47	1.36	1.49	1.44	1.39	1.34	1.21	1.15	1.22	1.29	1.34	1.45	....	1.14	1.025
23-23.9	1.26	1.26	1.28	1.13	1.19	1.49	1.38	1.51	1.46	1.41	1.36	1.23	1.17	1.24	1.31	1.35	1.48	....	1.16	1.05
24-24.9	1.28	1.28	1.30	1.15	1.21	1.51	1.40	1.53	1.48	1.43	1.38	1.25	1.19	1.26	1.33	1.38	1.51	....	1.18	1.075
Below 25	1.28	....	1.30	1.15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
25-25.9	1.30	1.30	1.32	1.17	1.23	1.53	1.42	1.55	1.50	1.45	1.40	1.27	1.21	1.28	1.35	1.40	1.54	....	1.20	1.10
25 & Above	....	....	....	....	....	....	....	....	....	....	....	1.27	....	....	....	....	....	....	....	....
26-26.9	1.32	1.32	1.34	1.19	1.25	1.55	1.44	1.57	1.52	1.47	1.42	1.29	1.23	1.30	1.37	1.42	1.57	....	1.22	1.125
27-27.9	1.34	1.34	1.36	1.21	1.27	1.57	1.46	1.59	1.54	1.49	1.44	1.31	1.25	1.32	1.39	1.44	1.59	....	1.24	1.15
28-28.9	1.36	1.36	1.38	1.23	1.29	1.59	1.48	1.61	1.56	1.51	1.46	1.33	1.27	1.34	1.41	1.46	1.61	....	1.26	1.175
Below 29	1.36	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$1.31	....	....
29-29.9	1.38	1.38	1.40	1.25	1.31	1.61	1.50	1.63	1.58	1.53	1.48	1.35	1.29	1.36	1.43	1.48	1.63	1.33	1.28	1.20
30-30.9	1.40	1.40	1.42	1.27	1.33	1.63	1.52	1.65	1.60	1.55	1.50	1.37	1.31	1.38	1.45	1.50	1.65	1.35	1.30	1.225
31-31.9	1.42	1.42	1.44	1.29	1.35	1.65	1.54	1.67	1.62	1.57	1.52	1.39	1.33	1.40	1.47	1.52	1.67	1.37	1.32	1.25
32-32.9	1.44	1.44	1.46	1.31	1.37	1.67	1.56	1.69	1.64	1.57	1.54	1.41	1.35	1.42	1.49	1.54	1.69	1.39	1.34	....
32 & Above	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1.275
33-33.9	1.46	1.46	1.48	1.33	1.39	1.69	1.58	1.71	1.66	1.61	1.56	1.43	1.37	1.44	1.51	1.56	1.71	1.41	1.36	....
Below 34	....	....	....	....	....	....	1.58	....	....	....	....	....	....	....	....	....	....	....	....	....
34-34.9	1.48	1.48	1.50	1.35	1.41	1.71	1.60	1.73	1.68	1.63	1.58	1.45	1.39	1.46	1.53	1.58	....	1.43	1.38	....
34 & Above	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1.73	....	....	....
35-35.9	1.50	1.50	1.52	1.37	1.43	1.73	1.62	1.75	1.70	1.65	1.60	1.47	1.41	1.48	1.55	1.60	....	1.45	1.40	....
36-36.9	1.52	1.52	1.54	1.39	1.45	1.75	1.64	1.77	1.72	1.67	1.62	1.49	1.43	1.50	1.57	1.62	....	1.47	1.42	....
37-37.9	1.54	1.54	1.56	1.41	1.47	1.77	1.66	1.79	1.74	1.69	1.64	1.51	1.45	1.52	1.59	1.64	....	1.49	1.44	....
38-38.9	1.56	1.56	1.58	1.43	1.49	1.79	1.68	1.81	1.76	1.71	1.66	1.53	1.47	1.54	1.61	1.66	....	1.51	1.46	....
39-39.9	1.58	1.58	1.60	1.45	1.51	1.81	1.70	1.83	1.78	1.73	1.68	1.55	1.49	1.56	1.63	1.68	....	1.53	1.48	....
40 & Above	1.60	1.60	1.62	1.47	1.53	1.83	1.72	1.85	1.80	1.75	1.70	1.57	1.51	1.58	1.65	1.70	....	1.55	1.50	....

PRICES ARE AS OF JULY 25, 1946, UNLESS OTHERWISE NOTED & ARE EXCLUSIVE OF FEDERAL SUBSIDY, IF ANY

Prices are shown by general areas. Details of fields where each company buys & exceptions to schedules as shown above will be furnished on request to NPN.

Oklahoma-Kansas

Schedule A: Carter, Continental, Gulf Oil Corp., Shell, Sinclair-Prairie, Sohio, S. O. Indiana, Texas Co.

Oklahoma

Schedule A: Deep Rock, Magnolia, Mid-Continent, Tide Water.

Schedule B: Anderson-Pritchard

Texas-New Mexico

Texas, North-North Central

Schedule A: Continental, Magnolia, Sinclair Prairie, Stanolind Oil Purchasing, Texas Co.

Texas, East Central

Schedule C: Humble, Sinclair Prairie.

Texas, West Central

Schedule A: Humble.

Texas, Panhandle

Schedule A: Humble, Magnolia, Texas Co.

Texas, East

$1.60 Flat Price: Atlantic, Humble, Magnolia, Ohio Oil, Pan American, Shell, Sinclair Prairie, Stanolind Oil Purchasing, Texas Co.

Texas, West (sour)

Schedule D: Atlantic, Humble, Magnolia, Shell, Sinclair Prairie, Stanolind Oil and Gas, Stanolind Oil Purchasing, Texas Co.

Texas, West (sweet)

Schedule A: Humble, Magnolia, Sinclair Prairie, Texas Co.

Texas, West (Fullerton)

Schedule E: Magnolia.

Texas, Gulf Coast

Schedule F: Atlantic, Humble, Sinclair Prairie, Stanolind Oil & Gas, Texas Co.

Texas, Arkansas

Schedule G: Atlantic (from Below 34 at $1.58), Pure Oil.

Texas, Refugio

Schedule H: Atlantic, Humble, Pure Oil, Sinclair Prairie, Texas Co.

Texas, Mirando

Schedule I: Continental (Starr County), Humble, Magnolia, Pan-American, Sinclair Prairie, Texas Co.

Texas, Anahuac (Gulf Coast Area)

Schedule J: Humble, Pan American, Sinclair Prairie, Stanolind Oil & Gas.

Texas, Coastal Crudes (Upper & Lower)

Schedule K: Humble, Pan American, Stanolind Oil Purchasing.

Texas (Hawkins & Talco)

Schedule L: to 25 & Above at $1.27): Humble, Magnolia.

Texas (Rodessa Area)

Schedule A: from Below 25 at $1.28): Magnolia.

Texas, Miscellaneous Crudes

Alief (Pure Oil)	$1.75
Bazette, Flag Lake (Humble)	1.60
Boyle, Ira & Lockhart (Starr County) Cont.	1.70
Cayuga (Pan American)	1.27
Charlotte, Imogene, Jourdanton, Mariposa, Pita	Schedule L
Chapel Hill (Below 50 Grav.) Sinclair Prairie	1.53
Chapel Hill (50 & Above) Sinclair Prairie	1.60
Clark, Hilbig, Lentz, Manford, Salt Flat, Tenney Creek, United Zoboroski (Humble)	1.49
Cleveland, N. Cleveland (Magnolia)	1.61
Conroe (Humble, Tide Water, Texas Co.)	1.78
Darst Creek (Humble, Magnolia)	1.50
Eureka Heights (Stanolind Oil Purchasing)	1.50
Flour Bluff, E. Flour Bluff (Sinclair Prairie)	1.68
Livingston, Mercy (Shell)	1.60
Long Lake (Sinclair Prairie)	1.58
Luling (Magnolia)	1.40
Lytton Springs (Magnolia)	1.52
Pearsall (Humble) From Below 20 at $1.10 with 2c differential to 40 & Above at	$1.52
Satsuma (Stanolind Oil Purchasing)	1.75
Taylor Link (Shell)	1.30
Tomball (Humble, Magnolia, Stanolind Oil Purchasing)	1.75
Van (Humble, Pure Oil)	1.43
Willamar (Pan American)	1.35
Yates (Pecos) Humble, Ohio Oil, Shell	1.30

New Mexico (sour)

Schedule D: Atlantic, Continental, Gulf Oil Corp. Humble, Magnolia, Shell, Sinclair Prairie, Texas Co.

New Mexico (sweet)

Schedule A: Humble.

Pennsylvania Grade

(All Pennsylvania Grade prices effective Aug. 1, 1946)

Posted by Jos. Seep Purchasing Agency

Bradford-Allegany	$3.35
Southwest Pennsylvania	3.00
Eureka (West Va.)	2.94
Buckeye (Pennsylvania Grade)	2.90
Corning, O.	1.66

Posted by The Pennzoil Co.

National Transit	*$3.28

Posted by Valvoline Pipelines Division of Freedom Valvoline Oil Co.

Bradford (Elk and McKean Cos., Pa.)	$3.35
Penna Grade in Warren, Forest, Venango, Clarion and Butler Cos., Pa.	3.28
Allegheny, Beaver, Washington and Greene Cos., Pa.	3.00
West Virginia	2.94
Southeastern Ohio	2.90
Zanesville, Ohio Penna. Grade	2.60

*Applies to Cochran, Franklin, Hamilton & Doolittle districts; prices in other lower districts range down to $3.23 per bbl. at well.

Michigan

Posted by Pure Oil Co.

Midland, Mecosta	$1.79
Sherman, Freeman, Temple, Reed City	1.74
Adams, Arenac	1.62
Goodwell	1.83

Posted by Simrall Corp., Mt. Pleasant, Mich.

Chippewa, Vernon, Greendale, Porter, Crystal, Wise, Fork, Bloomer, Cedar (Richfield type), Cato	1.79
West Branch, Clayton, Arenac	1.59
Buckeye, Edenville, Beaverton, Monitor, Kawkawlin, Hampton, Essexville	1.77
Freeman, Redding, Lincoln, Winterfield, Cedar, Norwich, Evart, Aetna, Enterprise, Hamilton, Riverside	1.74
Grout	1.64
Headquarters, Rose Lake	1.83
Foster, St. Helens	1.66

Posted by Sohio Petroleum Co., Mt. Pleasant, Mich.

Allegan, Kent, Ottawa and Van Buren Counties	$1.80
Coldwater (Isabella County)	1.79

Posted by Bay Pipe Line Corp.

Saginaw, Wise and Birch Run	$1.79	Buckeye, Bentley and Kawkawlin	$1.77
Essexville	1.77	Adams	1.62

Illinois-Indiana-Kentucky-Ohio

Posted by Sohio Petroleum Co., St. Louis, Mo

Indiana-Illinois Basin	$1.72
Western Kentucky	1.72

Posted by Ohio Oil Co.

Illinois Basin*	$1.72
Eastern Ill. and Western Ind.	1.57
Plymouth (Ill.)	1.50

*Also posted by Carter Oil Co., The Texas Co., Magnolia Petroleum Co. and Shell Oil Co.

Posted by Carter Oil Co.

Loudon and Mattoon pools	$1.72
Hitesville, Robards and St. Vincent pools, Kentucky	1.72

Prices in $ per bbl. of 42 U. S. gals. at the well.

Posted by Mohawk Oil Lines, Inc.

Southern Illinois 1.72

Posted by Ashland Oil & Transp. Co. Somerset oil in Ash. Lines, Ky.

Big Sandy and Kentucky Rivers $1.53
Western Kentucky $1.47

Posted by Owensboro-Ashland Co.

Owensboro, Ky. area $1.47

Posted by S. O. Ohio

Lima, Ohio 1.85
Cleveland, Lodi & Chatham (O) area 1.65

Louisiana-Arkansas

Arkansas (sour)

Schedule M: Arkansas Fuel, S. O. New Jersey

Louisiana, North (Cypress Bayou Area)

Schedule E: S. O. New Jersey.

Louisiana, North-Arkansas (sweet)

Schedule N: Arkansas Fuel, S. O. New Jersey.

Louisiana-Arkansas (Rodessa Caddo Area)

Schedule A: (from Below 20 & Below 25): Arkansas Fuel, Magnolia, S. O. New Jersey, Texas Co.

Louisiana, Central (Lake St. John-Nebo)

Schedule O: S. O. New Jersey.

Louisiana, Central (Olla Area)

Schedule K: Arkansas Fuel, Pan American, S. O. New Jersey.

Louisiana, South (Westwego Area)

Schedule O: S. O. New Jersey.

Louisiana, South (University Shallow)

Schedule F: Pure Oil, Shell, S. O. New Jersey, Stanolind Oil & Gas.

Louisiana Coastal

Schedule K: Shell, S. O. New Jersey.

Louisiana (Abbeville-Tepetate)

Schedule K: Continental.

Louisiana (Lockport Area)

Schedule Q: Magnolia.

Louisiana-Arkansas, Miscellaneous Crudes

Arkansas Sour Distillate (Limestone): Big Creek, Calhoun, Columbia, Dorcheat-Macedonia, McKamie (S. O. New Jersey) $1.65
Arkansas Sweet Distillate (Sandstone): Dorcheat-Macedonia (S. O. New Jersey) 1.70
Bear, Ville Platte, West Mermentau (Continental) 1.70
Cotton Valley Distillate (S. O. New Jersey) .. 1.75
Cotton Valley crude (Holloway Sand) 1.65
Creole (Pure Oil) 1.51
Georgetown (Arkansas Fuel) 1.60
Haynesville (Smackover Lime) Arkansas Fuel 1.65
Lisbon Distillate (S. O. New Jersey) 1.75
Longwood (Arkansas Fuel) 1.65
Neale (Atlantic) 1.55
Smackover (Arkansas Fuel) 1.28
Stephens (Ark.) Ohio Oil. From 25-25.9 at $1.31 with 2c differential to 30-30.9 at $1.41.
Sweet Lake (Pure Oil) $1.41
Tullos-Urania (Arkansas Fuel) 1.60

Mississippi

Mississippi, Central

Schedule O: S. O. New Jersey.

Mississippi (heavy sour)

Schedule E: Allied Pipe Line Corp., Carter, S. O. New Jersey.
Note: Flat price $1.75 posted by Pure Oil for Carthage Point Distillate; flat price $1.70 by S. O. New Jersey for Gwinville Distillate.

Rocky Mountain

Colorado

Florence (inc. Cannon City) Continental ... $1.40
Ft. Collins & Wellington (Continental) Schedule R
Iles (Stanolind Oil & Gas) ..... Schedule A
Rangely (S. O. Indiana) ..... Schedule S
Walden (Continental) ..... Schedule A

Montana

Cat Creek (Continental) $1.70
Cut Bank (Carter) 1.65
Darling (Carter) 1.45
Dry Creek (Ohio Oil) 1.37
Elk Basin Frontier (Stan. Oil & Gas) Schedule A
Elk Basin Light (Ohio Oil) ..... Schedule A
Elk Basin Tensleep (Carter, Ohio Oil) Stanolind Oil & Gas ..... Schedule T
Frannie Light (Carter) ..... Schedule T
Gage Dome (Carter) 1.65

Wyoming

Bailey Dome & Lost Soldier (other than Tensleep), Crooks Gap (Sinclair Wyoming) Schedule A
Bailey Dome & Lost Soldier Tensleep (Sinclair Wyoming) ..... Schedule D
Big Muddy (Continental) $1.48
Big Sand Draw, Mahoney Dome, Wertz (Sinclair Wyoming) ..... Schedule D
Byron (Carter) 1.05
Circle Ridge, Gebo, Hamilton Dome, Little Buffalo Basin, Maverick Springs, Pilot Butte, Steamboat Butte, Winkleman Dome, Zimmerman Butte (S. O. Indiana) ..... Schedule T
E. Mahoney Dome (Sinclair Wyoming). From Below 29 at $1.21 with 2c differential to 40 & Above at $1.45.
Elk Basin Frontier (Stanolind Oil & Gas) Schedule A
Elk Basin Light (Ohio Oil) ..... Schedule A
Elk Basin Tensleep (Carter, Ohio Oil, Stanolind Oil & Gas) ..... Schedule T
Frannie (Carter, S. O. Indiana) ..... Schedule T
Garland (Carter) ..... $.95
Grass Creek Light (Ohio Oil, S. O. Indiana) Schedule A
Grass Creek Heavy (Embar-Tensleep) Ohio Oil, S. O. Indiana ..... Schedule T
Lance Creek (Continental, Ohio Oil) .. Schedule A
Littel Buck & E. Lance Creek (Continenlta) ..... Schedule A
Mule Creek (Carter) $1.36
Oregon Basin (Carter, Ohio Oil, S. O. Indiana) ..... Schedule T
Osage (Carter) $1.70
Salt Creek (Other than Tensleep) Stanolind Oil & Gas ..... Schedule A
Salt Creek Tensleep (Stanolind Oil & Gas) Schedule T

Note: Ohio Oil buys Byron and Garland crudes at Schedule T prices.

Canadian Fields

Posted by Imperial Oil Limited

Oil Springs (Dec. 16, 1942) $2.42
Petrolia (Dec. 16, 1942) 2.35

Turner Valley (Jan. 1, 1946), prices FOB producer's tankage. Beginning with 33-33.9 at $1.97 with 2c differential for each degree of gravity, and ending with 64 & Over at $2.59, representing an increase of 45c per barrel.

Turner Valley natural gasoline, 26 lbs. R.V.P. $2.28

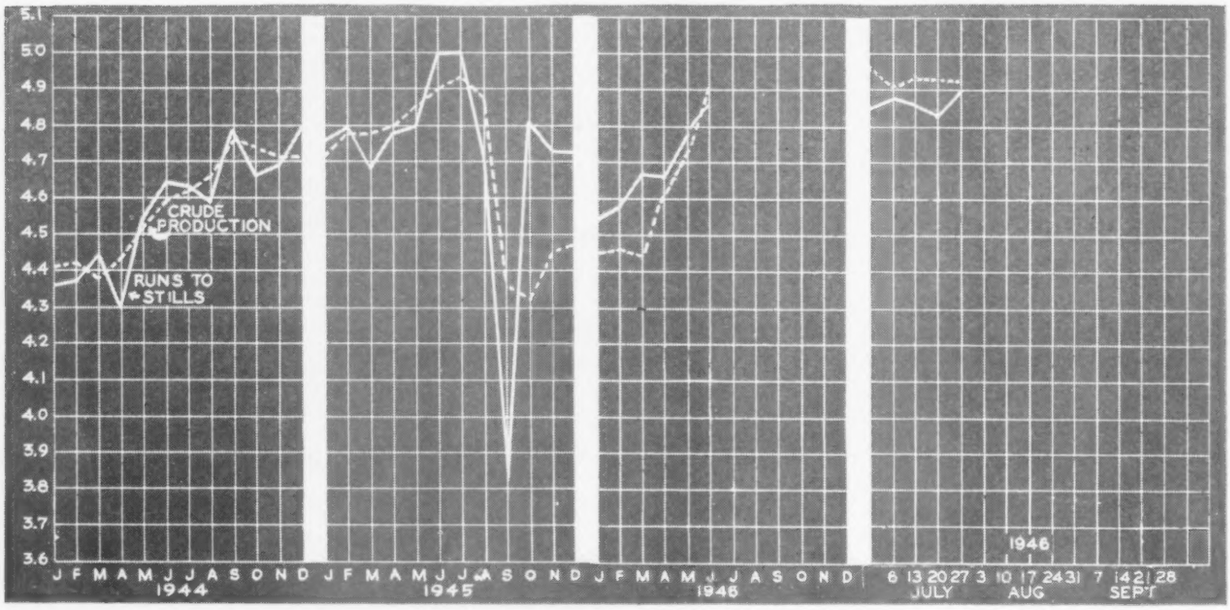
California

Posted by S. O. California, August 1, 1946 *(All gravities above those quoted take highest price offered in that field)*

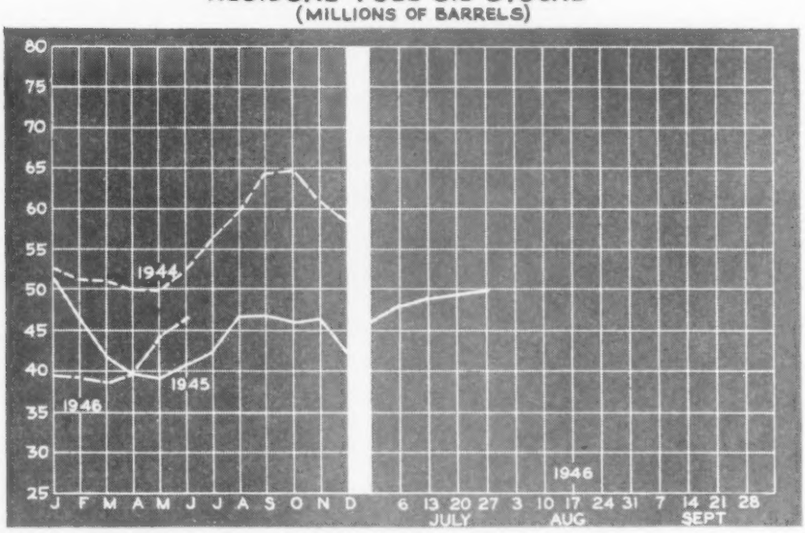
Gravity	Signal Hill (Long Beach)	Wilmington	El Segundo	Seal Beach	Huntington Beach	Inglewood	Olinda Brea Canon	Athens-Rosecrans	Torrance	Richfield	Whittier East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Greeley, Canal, Wasco	Coles Levee, Elk Hills Stevens Zone	Mountain View	Elk Hills, Shallow Buena Vista Hills Midway-Sunset, Lakeview Area	Lost Hills	Coalinga
12-12.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$1.14	$1.14	$1.14
13-13.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1.16	1.16	1.16
14-14.9	....	$1.13	....	....	$1.16	....	$1.15	....	$1.15	$1.15	$1.15	$1.17	....	....	....	....	....	1.18	1.18	1.18
15-15.9	....	1.16	....	....	1.20	$1.21	1.17	....	1.17	1.16	1.17	1.17	....	....	....	....	....	1.18	1.18	1.18
16-16.9	....	1.16	$1.21	....	1.20	1.21	1.17	....	1.17	1.16	1.17	1.17	....	....	....	....	....	1.18	1.18	1.18
17-17.9	....	1.19	1.21	....	1.20	1.21	1.17	....	1.17	1.16	1.17	1.17	....	....	....	....	....	1.18	1.18	1.18
18-18.9	$1.17	1.22	1.21	....	1.23	1.23	1.20	....	1.17	1.19	1.20	1.18	....	....	....	....	....	1.18	1.18	1.18
19-19.9	1.21	1.26	1.21	....	1.27	1.26	1.24	....	1.19	1.23	1.23	1.21	....	....	....	....	$1.18	1.18	1.19	1.18
20-20.9	1.24	1.29	1.21	....	1.31	1.29	1.27	....	1.22	1.27	1.26	1.24	....	....	....	....	1.18	1.22	1.22	1.19
21-21.9	1.28	1.32	1.22	....	1.34	1.31	1.31	....	1.26	1.30	1.29	1.26	....	....	....	....	1.18	1.26	1.25	1.21
22-22.9	1.32	1.36	1.26	$1.24	1.37	1.34	1.34	....	1.29	1.34	1.32	1.29	$1.32	....	....	....	1.20	1.30	1.28	1.24
23-23.9	1.35	1.39	1.30	1.29	1.40	1.37	1.37	....	1.33	1.37	1.35	1.32	1.35	....	....	....	1.24	1.34	1.30	1.26
24-24.9	1.39	1.42	1.33	1.34	1.42	1.39	1.41	....	1.36	1.41	1.38	1.35	1.37	....	....	....	1.28	1.38	1.33	1.29
25-25.9	1.43	1.46	1.37	1.38	1.45	1.42	1.44	....	1.39	1.44	1.41	1.38	1.40	....	....	....	1.32	1.42	1.36	1.31
26-26.9	1.46	1.49	1.41	1.43	1.47	1.44	1.48	....	1.43	1.48	1.44	1.41	1.43	....	....	....	1.36	1.46	1.39	1.34
27-27.9	1.50	1.52	1.44	1.48	1.49	1.47	1.51	$1.43	1.46	....	1.47	1.45	1.46	$1.44	....	....	1.40	1.50	1.42	1.36
28-28.9	1.54	1.56	1.48	1.52	1.51	1.50	1.54	1.47	1.49	....	....	1.48	1.49	1.48	....	....	1.44	1.54	1.44	1.38
29-29.9	1.57	1.59	....	1.57	1.53	1.52	....	1.51	....	....	....	1.52	1.51	1.52	....	....	1.49	1.59	1.47	1.41
30-30.9	1.61	1.62	....	1.61	1.55	1.55	....	1.55	....	....	....	1.55	1.54	1.55	$1.35	$1.49	1.53	1.63	1.50	1.43
31-31.9	....	....	....	1.66	....	1.58	....	1.59	....	....	....	1.59	1.57	1.59	1.39	1.44	....	....	....	1.46
32-32.9	....	....	....	1.69	....	....	....	1.63	....	....	....	1.63	1.60	1.63	1.43	1.47	....	....	....	1.48
33-33.9	....	....	....	....	....	....	....	1.67	....	....	....	1.67	1.62	1.66	1.47	1.51	....	....	....	1.51
34-34.9	....	....	....	....	....	....	....	1.71	....	....	....	1.71	1.65	1.70	1.51	1.54	....	....	....	1.53
35-35.9	....	....	....	....	....	....	....	....	....	....	....	1.75	1.68	....	1.55	1.57	....	....	....	....
36-36.9	....	....	....	....	....	....	....	....	....	....	....	1.78	....	....	1.59	1.61	....	....	....	....
37-37.9	....	....	....	....	....	....	....	....	....	....	....	1.81	....	....	1.62	....	....	....	....	....
38-38.9	....	....	....	....	....	....	....	....	....	....	....	1.83	....	....	1.65	....	....	....	....	....
39-39.9	....	....	....	....	....	....	....	....	....	....	....	1.86	....	....	....	....	....	....	....	....
40-40.9	....	....	....	....	....	....	....	....	....	....	....	1.89	....	....	....	....	....	....	....	....

Wheeler Ridge: 22-22.9, $1.17; 23-23.9, $1.21; 24-24.9, $1.25. **Newhall, Kern River, Kern Front, McKittrick and Round Mountain:** 12-12.9, $1.14; 13-13.9, $1.16; 14-14.9, $1.18; 15-15.9, $1.18; 16-16.9, $1.18; 17-17.9, $1.18; 18-18.9, $1.18. **Ellwood Terrace** (FOB ship) 33-33.9, $1.60; 34-34.9, $1.64; 35-35.9, $1.68; **Gato Ridge:** 12-12.9, $0.94; 13-13.9, $0.96; 14-14.9, $0.98; 15-15.9, $1.00; **Kettleman Hills:** 35-35.9, $1.61; 36-36.9, $1.65, 37-37.9, $1.69.

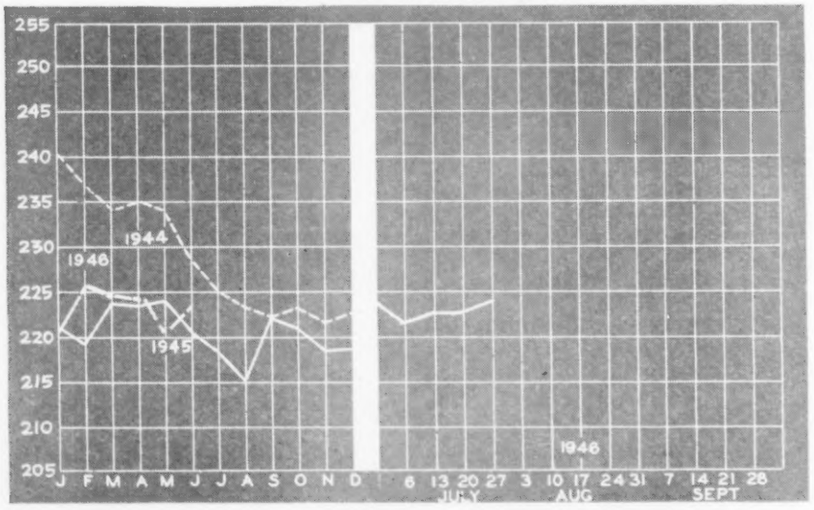
CRUDE PRODUCTION AND RUNS TO STILLS
(MILLIONS OF BARRELS)



RESIDUAL FUEL OIL STOCKS
(MILLIONS OF BARRELS)



CRUDE OIL STOCKS
(MILLIONS OF BARRELS)



Daily Ave. Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies refining Pennsylvania crude. Figures in bbls.)

Week Ended July 27, 1946	Week Ended July 20, 1946	Week Ended July 28, 1945
57,497	60,346	62,680

Crude Oil Stocks

(Thousands of bbls.)

(Bureau of Mines Figures)

Grade or Origin	July 20	July 27	Change from July 20
Pennsylvania Grade	2,313	2,347	+ 34
Other Appalachian	1,732	1,572	—160
Lima-Michigan	1,060	1,045	— 15
Illinois-Indiana	17,404	17,882	+478
Arkansas	2,561	2,536	— 25
Kansas	8,693	8,637	— 56
Louisiana	11,284	11,032	—252
North	3,034	2,918	—116
Gulf Coast	8,250	8,114	—136
Mississippi	2,235	2,397	+162
New Mexico	5,801	5,838	+ 37
Oklahoma	33,557	33,067	—490
Texas	103,390	104,293	+903
East Texas	16,165	16,027	—138
West Texas	36,391	36,945	+554
Gulf Texas	27,768	27,381	—387
Other Texas	23,066	23,940	+874
Panhandle	3,999	3,890	—109
North	6,120	6,351	+231
South	4,956	5,508	+552
Other	7,991	8,191	+200
Rocky Mountain	8,850	9,038	+188
California	20,421	20,395	— 26
Foreign	3,439	3,677	+238
Total gasoline-bearing in U. S.	222,740	223,756	+1,016
Heavy in California	4,624	4,613	— 11
Total located in Bureau of Mines East Coast District	12,733	13,297	+564

REFINERY OPERATIONS

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Average Crude Runs to Stills Week Ended		Gasoline Production at Refineries inc. Natural Blended Week Ended		Kerosine Production Week Ended		Gas Oil and Dist. Fuel Oil Production Week Ended		Residual Fuel Oil Production Week Ended	
	July 27	July 20	July 27	July 20	July 27	July 20	July 27	July 20	July 27	July 20
East Coast	758	763	1,822	1,702	279	296	1,043	1,022	1,450	1,289
Appalachian (Dist. 1)	89	82	251	229	48	43	61	62	76	72
Appalachian (Dist. 2)	55	57	199	172	5	13	18	23	88	84
Ind., Ill., Ky.	798	797	2,704	2,676	284	241	761	599	1,055	1,073
Okla., Kans., Mo.	382	378	1,335	1,335	122	175	474	412	448	449
Inland Texas	226	220	906	906	86	80	92	87	426	415
Texas Gulf Coast	1,217	1,220	3,527	3,235	540	705	1,647	1,676	1,704	1,771
Louisiana Gulf Coast	357	336	984	949	286	275	567	595	388	373
No. La. & Arkansas	61	59	140	148	40	42	77	67	104	99
Rocky Mt. (Dist. 3)	12	12	39	38	6	6	9	10	26	26
Rocky Mt. (Dist. 4)	118	116	347	387	14	9	108	99	238	232
California	823	786	2,281	2,209	141	125	960	644	2,214	2,388
Total U. S.—B. of M. Basis	4,896	4,826	14,535	13,986	1,851	2,010	5,817	5,296	8,217	8,271
U. S.—B. of M. Basis, July 28, 1945	5,012		16,481		1,403		4,652		9,688	

Districts	Total Stocks Kerosine Week Ended		Total Stocks Gas Oil and Distillates Week Ended		Total Stocks Residual Fuel Oil Week Ended		Stocks of Finished and Unfinished Gasoline Week Ended		Per Cent Daily Refining Capacity Reported Week Ended	
	July 27	July 20	July 27	July 20	July 27	July 20	July 27	July 20	July 27	July 20
East Coast	6,632	6,354	14,215	13,214	9,531	9,563	22,774	22,905	99.5	99.5
Appalachian (Dist. 1)	323	324	431	429	214	208	2,210	2,232	76.3	76.3
Appalachian (Dist. 2)	62	71	144	152	149	145	891	949	84.7	84.7
Ind., Ill., Ky.	2,454	2,318	6,483	6,145	4,365	4,286	16,539	16,815	87.4	87.4
Okla., Kans., Mo.	1,135	1,146	2,663	2,681	1,368	1,380	7,813	7,711	78.3	78.3
Inland Texas	415	397	491	445	753	709	2,625	2,805	59.8	59.8
Texas Gulf Coast	2,165	2,229	6,989	7,016	4,954	4,836	13,708	13,697	89.2	89.2
Louisiana Gulf Coast	1,202	1,130	2,241	2,158	1,434	1,447	1,434	4,186	97.4	97.4
N. La. & Arkansas	304	327	436	421	152	170	1,898	1,856	55.9	55.9
Rocky Mt. (Dist. 3)	20	20	42	43	44	45	93	95	19.0	19.0
Rocky Mt. (Dist. 4)	175	166	484	487	775	753	1,584	1,728	70.9	70.9
California	732	705	9,697	9,420	25,778	25,635	14,224	14,347	85.5	85.5
Total U. S.—B. of M. Basis	15,619	15,187	44,316	42,611	49,517	49,177	*88,626	89,326	85.8	85.8
U. S.—B. of M. Basis, July 28, 1945	10,969		35,929		42,760		‡86,181			

Unfinished gasoline stocks included are: * 8,713,000 bbls., ‡ 11,215,000 bbls.

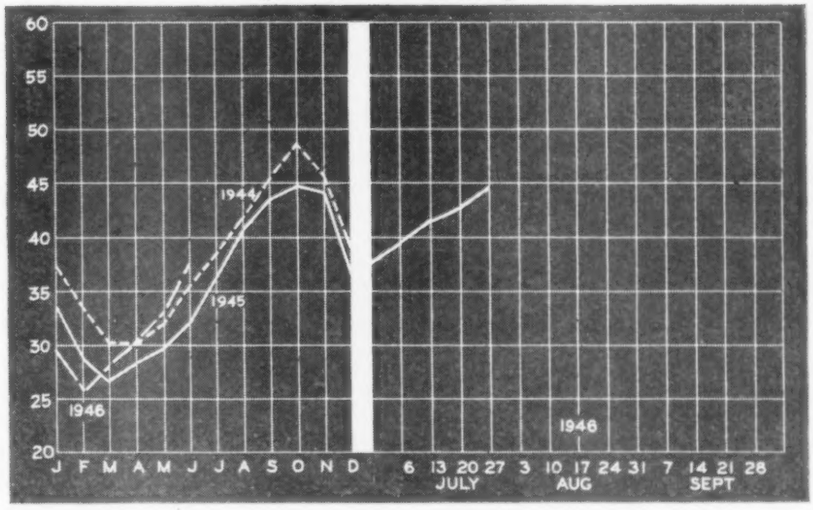
U. S. Crude Oil Production

(American Petroleum Institute figures)

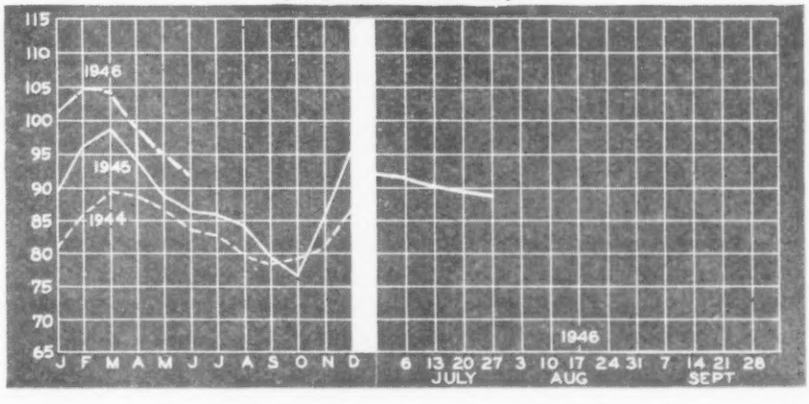
	WEEK ENDED July 27 Barrels (Daily Average)	WEEK ENDED July 20 Barrels (Daily Average)
*New York-Penna.	49,900	47,950
Florida	200	200
*West Virginia	7,200	6,450
*Ohio—Southeast	4,850	5,000
Ohio—Other	2,450	2,200
Indiana	18,950	18,700
Illinois	210,800	206,950
Kentucky	31,150	31,700
Michigan	45,950	45,900
Nebraska	**800	750
Kansas	**271,500	275,650
Oklahoma	**383,650	383,700
Texas:		
District 1	19,500	19,500
District 2	158,100	158,100
District 3	511,350	511,350
District 4	228,000	228,000
District 5	44,150	44,150
East Texas	315,000	315,000
Other District 6	107,800	107,800
District 7-B	32,000	32,000
District 7-C	27,950	27,950
District 8	569,150	569,150
District 9	129,300	129,300
District 10	85,150	85,150
Total Texas	2,227,450	2,227,450
North Louisiana	83,400	83,150
South Louisiana	300,650	300,650
Total Louisiana	384,050	383,800
Arkansas	73,650	75,250
Mississippi	64,950	64,050
Alabama	1,150	1,150
New Mexico—Southeast	98,150	98,150
New Mexico—Other	500	500
Wyoming	113,650	114,250
Montana	25,350	24,650
Colorado	36,650	37,300
California	873,100	885,400
Total U. S.	4,926,050	4,937,100
*Penna Grade crude included	61,950	59,400

**Okla., Kansas, Neb. figures are for week ended 7 a. m., July 24, 1946.

GAS OIL AND DISTILLATE STOCKS
(MILLIONS OF BARRELS)



GASOLINE STOCKS
(MILLIONS OF BARRELS)



Pacific Coast Demand

(Bureau of Mines figures in thousands of bbls.)

	Gasoline		Gas Oil & Diesel		Heavy Fuel Oil		All Products	
	1945	1946	1945	1946	1945	1946	1945	1946
January	304	248	104	139	545	432	1,066	917
February	315	283	100	129	594	439	1,124	947
March	332	300	94	106	519	448	1,068	962
April	406	274	83	101	536	376	1,148	851
May	402	323	75	78	520	351	1,135	864
June	398	..	64	..	490	..	1,085	..
July	396	..	59	..	421	..	1,011	..
August	370	..	78	..	434	..	1,010	..
September	363	..	76	..	400	..	954	..
October	269	..	76	..	443	..	897	..
November	271	..	106	..	418	..	901	..
December	265	..	117	..	479	..	969	..
Jan.-May	352	286	91	111	542	409	1,108	908

Midcontinent Lubricating Oils

(All figures are in barrels of 42 gals.)

	Bright Stock	Viscous Neutrals	Paraffin Oils	Steam Refined Stock	Blended Oils
Production	223,319	340,867	71,451	32,019	352,469
Shipments:					
Domestic	267,894	336,769	71,975	21,516	348,963
Export	25,016	5,240	7	124	14,770
TOTAL	292,910	342,009	71,982	21,640	363,733
Inventory, May 31, 1946	178,484	208,010	73,916	35,717	172,603
Days Supply	23	20	....	....	....

Pennsylvania Lubricating Oils

(Compiled by National Petroleum Assn. from reports of companies refining Pennsylvania Grade crude oil. Figures in bbls.)

	Production May 1946	Inventory May 1946	Production April 1946	Inventory April 1946
Raw long residuum	12,873	7,342	12,486	8,110
600 steam refined stock	246,512	133,317	233,129	115,889
Other steam refined stock	61,699	43,843	55,852	40,609
Finished dewaxed long residuum	37,073	38,559	35,934	41,830
Bright stock	146,937	167,323	156,506	183,051
Viscous neutral (below 180 Vis.)	68,594	133,347	70,006	127,072
Viscous neutral (180 Vis. at 100)	98,754	99,686	87,973	85,974

Production of Natural Gasoline

(Bureau of Mines figures in gals., 000 omitted)

	Apr. 1946	Mar. 1946
East Coast	....	....
W. New York	..	1
W. Pennsylvania	918	1,093
West Virginia	8,447	8,532
Ohio	507	518
Illinois	12,853	13,470
Kentucky	3,760	3,846
Michigan	1,156	1,151
Kansas	6,527	6,223
Oklahoma	32,293	35,506
Texas:	176,579	183,148
Gulf	41,261	43,308
East Texas	31,661	27,939
Panhandle	38,002	44,469
Other	65,655	67,432
Arkansas	6,485	6,565
Louisiana:	46,882	43,760
Gulf	28,345	24,935
Inland	18,537	18,825
New Mexico	8,212	8,000
Colorado	*	*
Montana	347	450
Utah	*	*
Wyoming	*3,332	*3,332
California	72,761	75,989
Total	381,059	391,584
Daily average	12,702	12,632
Total (thousands of bbls.)	9,073	9,323
Daily average	302	301

*Wyoming includes Colorado and Utah drip gasoline.

Dealer & Service Station Prices for Regular-Grade Gasoline in 50 Representative U.S. Cities June 1, 1946

(American Petroleum Institute figures)

City	State	Dealers' Net Price (Ex. Tax)	Indicated Dealer Margin	Gasoline Tax (Inc. 1½ Cent Federal Tax)	Service Station (Inc. Tax)
Average United States		09.99	4.19	06.09	20.27
Portland, Me.		09.60	4.0	05.50	19.10
Manchester, N. H.		10.60	4.1	05.50	20.20
Burlington, Vt.		10.20	4.0	05.50	19.70
Boston, Mass.		09.20	4.0	04.50	17.70
Providence, R. I.		09.30	4.5	04.50	18.30
Hartford, Conn.		09.90	4.0	04.50	18.40
Buffalo, N. Y.		09.50	4.5	05.50	19.50
New York, N. Y.		09.40	5.4	05.50	20.30
Newark, N. J.		08.70	5.0	04.50	18.20
Philadelphia, Pa.		09.00	4.0	05.50	*18.50
Dover, Del.		09.50	4.6	05.50	19.60
Baltimore, Md.		08.45	4.35	05.50	18.30
Washington, D. C.		08.70	4.3	04.50	17.50
Charleston, W. Va.		10.30	5.0	06.50	21.80
Norfolk, Va.		08.70	6.1	07.50	22.30
Charlotte, N. C.		09.80	4.5	07.50	21.80
Charleston, S. C.		09.20	5.0	07.50	21.70
Atlanta, Ga.		10.50	4.0	07.50	22.00
Jacksonville, Fla.		09.50	4.0	08.50	22.00
Birmingham, Ala.		10.00	4.5	08.50	*23.00
Vicksburg, Miss.		09.50	5.0	07.50	22.00
Memphis, Tenn.		08.90	4.5	08.50	21.90
Lexington, Ky.		10.50	3.5	06.50	20.50
Youngstown, Ohio		09.50	3.0	05.50	18.00
South Bend, Ind.		10.50	4.5	05.50	20.50
Chicago, Ill.		09.90	2.75	04.50	17.15
Detroit, Mich.		09.90	3.62	04.50	18.02
Milwaukee, Wisc.		10.60	4.3	05.50	20.40
Twin Cities, Minn.		10.40	4.5	05.50	20.40
Fargo, N. Dak.		11.40	4.0	05.50	20.90
Huron, S. Dak.		10.80	4.0	05.50	20.30
Omaha, Neb.		09.60	3.0	06.50	19.10
Des Moines, Ia.		09.90	3.5	05.50	18.90
Wichita, Kans.		08.80	3.2	05.50	17.50
St. Louis, Mo.		09.50	3.0	04.50	*17.00
Tulsa, Okla.		08.00	3	09.00	20.00
Little Rock, Ark.		09.20	4.8	08.00	22.00
New Orleans, La.		08.45	5.05	08.50	22.00
Houston, Texas		08.50	4.5	05.50	18.50
Albuquerque, N. Mex.		10.50	4.5	07.00	**22.00
Denver, Colo.		10.00	4.0	05.50	19.50
Casper, Wyo.		11.50	4.0	05.50	22.00
Butte, Mont.		09.50	4.0	06.50	20.00
Boise, Ida.		13.50	4.0	07.50	25.00
Salt Lake City, Utah		13.50	4.5	05.50	23.50
Reno, Nev.		12.00	4.0	05.50	21.50
Phoenix, Ariz.		12.00	6.0	06.50	22.50
San Francisco, Cal.		10.00	4.0	04.50	18.50
Portland, Ore.		10.50	4.0	06.50	21.00
Spokane, Wash.		12.50	4.0	06.50	23.00

* Includes City Tax of $.0100
** Includes City Tax of $.0050

Pennsylvania Oils Other Than Lubes at Refineries

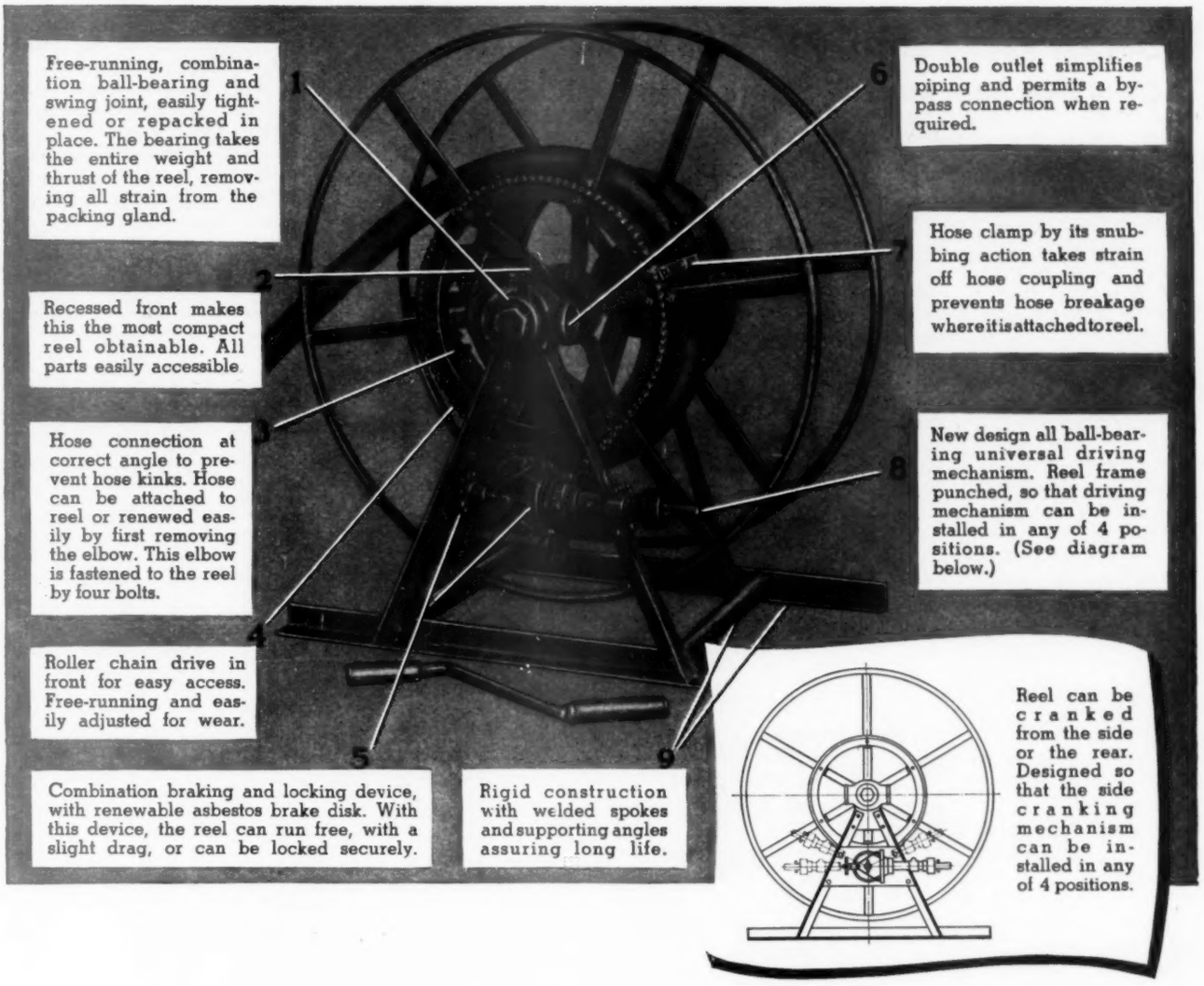
(Compiled by National Petroleum Assn. from reports of oil region refiners. Figures in bbls.)

Naphthas & Gasoline:	May, 1946	Apr., 1946
(1) Straight run, unblended and/or unleaded for sale as motor fuel	....	4,208
(2) Naphtha and gasoline, for sale for blending or further refining, or held at refinery for further distillation, reforming, blending or leading	315,562	336,187
(3) Below 65 octane, not included in (1) or (2) above	1,728	2,797
(4) 65 octane and above	300,129	301,425
Salable Naphthas other than motor fuel (does not include refinery process naphthas)	10,255	13,198
Kerosine	94,334	97,678
36/40 gas oil (include furnace oil)	79,633	45,843
Fuel oil (not reported above)	30,973	20,229
Oils held as cracking plant charging stocks	349,026	308,629
Non-viscous neutral	27,369	24,797
Wax distillate	90,774	77,561
Crude Petrolatum	31,328	33,908
Wax (lbs.)	3,353,794	3,901,093

Net Stocks of Pennsylvania Crude Oil

(Compiled by National Petroleum Assn. Figures in bbls.)

	May 31, 1946	April 30, 1946	May 31, 1945
At Refineries	296,414	263,009	339,343
Pipeline and Tank Farms	1,731,452	1,631,839	1,455,068
Total	2,027,866	1,894,848	1,784,411


1
Free-running, combination ball-bearing and swing joint, easily tightened or repacked in place. The bearing takes the entire weight and thrust of the reel, removing all strain from the packing gland.
2
Recessed front makes this the most compact reel obtainable. All parts easily accessible.
3
Hose connection at correct angle to prevent hose kinks. Hose can be attached to reel or renewed easily by first removing the elbow. This elbow is fastened to the reel by four bolts.
4
Roller chain drive in front for easy access. Free-running and easily adjusted for wear.
5
Combination braking and locking device, with renewable asbestos brake disk. With this device, the reel can run free, with a slight drag, or can be locked securely.
9
Rigid construction with welded spokes and supporting angles assuring long life.
6
Double outlet simplifies piping and permits a by-pass connection when required.
7
Hose clamp by its snubbing action takes strain off hose coupling and prevents hose breakage where it is attached to reel.
8
New design all ball-bearing universal driving mechanism. Reel frame punched, so that driving mechanism can be installed in any of 4 positions. (See diagram below.)
Reel can be cranked from the side or the rear. Designed so that the side cranking mechanism can be installed in any of 4 positions.

The New Hose Reel You Have Been Looking For

COMPACT, RUGGED, LIGHT IN WEIGHT, BALL-BEARING CONSTRUCTION THROUGHOUT

The New Philadelphia Valve Co. reel is the finest reel built. It is compact, rugged, and light in weight. All parts are of steel, malleable iron, or bronze; no cast iron is used. It is ball-bearing throughout with hardened and ground races. (6 ball bearings are used.) It will never wear out.

The reel can be changed from top winding to bottom winding by reversing the hose connection and rotating the drum. All working parts and hose connections are in front and easily accessible. It is light in weight, a reel that holds 100 feet of 1½" hose, weighs only 93 pounds.

We can furnish hose reels in any size or shape. They can be furnished for installation either in bucket box at rear of truck or in underslung box on side of truck. Give inside dimensions of box when writing for information. Special reels can also be furnished for Airfield Refueling Pits and Ship Docks.

Delivery can generally be made in a few days after receipt of order. For sizes, prices, and dimensions, write for Catalogue No. 165.

PHILADELPHIA VALVE COMPANY

ARAMINGO AVENUE AND ONTARIO STREET, PHILADELPHIA 34, PA.

Oil Marketing Equipment Company, 321-325 Fremont Street, San Francisco 5, Cal.

Octane Rating of Gasoline Sold in the Winter Of '45-46 Reaches New High, Survey Reveals

NPN News Bureau

WASHINGTON — You can take the word of U. S. Bureau of Mines that American motorists last winter were sold the highest average octane-rated gasoline ever offered for public use.

Based on an analysis of 3,735 individual samples from 21 major marketing areas of the nation, bureau's first peacetime survey since the summer of 1941 showed that average octane number of premium grade motor fuels sold last winter was 80.9, compared with 1935-36 winter average of 76.7 and a prewar high average of 80.4 in summer of 1941.

Average octane number of regular gasoline last winter was 75.9, as compared with 69.5 a decade ago and a prewar high average of 74.7 in summer of 1941.

Bureau said average ratings reached their lowest level in the summer of 1945 when average for premium was only 74.9 and 69.7 for regular.

Bureau's survey is 19th in a series begun in 1936 in co-operation with Coordinating Fuel Research Committee of Co-ordinating Research Council, Inc. Samples analyzed in the survey were submitted by 19 petroleum testing laboratories for 100 large and small companies and represented greatest number ever used. Samples first were collected from service stations in 318 cities in 44 states and the District of Columbia.

Copies of survey, "Report of Investigations 3659, National Motor-Gasoline Survey, Winter 1945-46," may be obtained from Bureau of Mines, Interior Department, Washington 25, D. C. Included in report is a map showing selected locations in the 21 marketing districts sampled, octane values as determined by ASTM method and data on the following: gravity, sulfur content, Reid vapor pressure, research octane number, and distillation characteristics for premium and regular motor fuels and for a few third-grade motor fuels.

The following tabulation by districts summarizes the octane ratings as revealed by the current and past surveys:

	Premium-price gasoline				Regular-price gasoline			
	Winter	Summer	Summer	Winter	Winter	Summer	Summer	Winter
District	1935-36	1941	1945	1945-46	1935-36	1941	1945	1945-46
Boston	76.6	80.6	75.4	80.9	69.3	76.3	70.1	76.9
New York	77.3	81.0	75.2	81.3	69.7	75.7	70.0	76.9
Washington, D. C.	76.5	80.9	75.5	81.3	69.2	75.8	70.1	76.7
Pittsburgh	76.6	80.1	74.8	81.1	69.6	75.8	70.1	76.8
Cleveland	76.2	80.5	75.5	80.0	69.9	75.4	70.2	76.0
Detroit	75.9	79.3	74.8	80.0	69.0	75.4	70.0	75.6
Atlanta	....	80.0	75.1	81.2	....	75.1	69.9	76.9
Memphis	....	81.0	74.3	80.7	....	76.2	69.5	76.2
Chicago	75.5	79.8	75.0	79.7	69.7	74.4	69.5	75.1
New Orleans	75.9	80.4	75.1	81.2	70.1	76.2	70.2	76.4
St. Louis	75.8	79.9	74.7	80.0	69.6	74.1	69.8	75.1
Minneapolis	76.9	79.5	74.3	79.5	69.8	74.1	69.8	74.9
Omaha	75.5	79.4	75.1	79.9	69.4	73.9	69.8	75.1
Tulsa	75.8	79.5	75.0	79.5	69.7	73.4	69.4	75.1
Texas	74.3	79.6	74.6	80.3	69.4	75.1	69.9	76.2
South Rocky Mountain	.	79.7	74.4	80.5	.	71.7	68.5	75.4
Middle Rocky Mountain	75.0	79.6	74.3	79.4	69.4	72.7	68.8	74.3
North Rocky Mountain	.	80.9	74.1	79.5	.	73.7	68.5	74.1
Seattle	80.3	81.5	76.0	84.4	68.6	73.8	70.1	76.1
Los Angeles	79.9	82.5	75.1	84.1	69.5	75.7	70.1	76.4
San Francisco	80.1	82.0	75.6	84.3	70.2	74.8	70.2	77.1
National Average	76.7	80.4	74.9	80.9	69.5	74.7	69.7	75.9

GASOLINE CONSUMPTION BY STATES, APRIL, 1946

(American Petroleum Institute Figures)

	Tax Rate†	Month of				4 Months Ending With		
	April Cents	Mar., 1946 Gallons	Apr., 1946 Gallons	Apr., 1945 Gallons	Change %	Apr., 1946 Gallons	Apr., 1945 Gallons	Change %
Alabama	6	31,548,000	32,372,000	22,654,000	+42.90	119,893,000	93,024,000	+28.88
Arizona	5	14 009,000	14,408,000	11,939,000	+20.68	54,695,000	40,873,000	+33.82
Arkansas	6½	21,810 000	21,113,000	15,760,000	+33.97	79,976 000	61,502,000	+30.04
California	3	255 657.000	249,094,000	214,280,000	+16.25	952,335,000	809,974,000	+17.58
Colorado	4	25.237.000	27,399 000	21,102 000	+29.84	93.297.000	90.296.000	+ 3.32
Connecticut	3	28.536 000	31,087,000	21,803,000	+42.58	109,724,000	86,788,000	+26.43
Delaware	4	5,333 000	5,799,000	4,124,000	+40.62	20,262,000	15,140,000	+33.83
District of Columbia	3	11.798.000	12,059,000	8,520,000	+41.54	45,888,000	35 293,000	+60.04
Florida	7	50.519.000	47,851,000	33,012,000	+44.95	194,600 000	135,078.000	+44.06
Georgia	6	44.730.000	46,094.000	30,713,000	+50.08	173,762,000	124,068,000	+40.05
Idaho	6	9,960 000	12,889,000	8,100 000	+59.12	38,096 000	27,507,000	+38.50
Illinois	3	127,569,000	152,952,000	98,374,000	+55.48	484,704,000	358,662,000	+35.14
Indiana	4	66.675.000	83,512,000	60,827,000	+37.29	267,104,000	228,596,000	+16.85
Iowa	4	50,857,000	81.418,000	51,959,000	+56.70	218.855,000	166 746,000	+31.25
Kansas	4	33,327,000	46,740,000	34,921,000	+33.84	170,318 000	130,397 000	+30.61
Kentucky	5	32.455 000	33,756,000	30.355.000	+11.28	121,623,000	112,830,000	+ 7.79
Louisiana	7	29,712 000	30.867,000	24,251 000	+27.28	114,411 000	95.415 000	+19.91
Maine	4	12.264.000	12,928,000	10.049,000	+28.65	46.245,000	39,654,000	+16.62
Maryland	4	29.054 000	32,111,000	28.220,000	+13.79	111,387,000	109,075,000	+ 2.12
Massachusetts	3	55.497,000	60.430.000	43.764,000	+38.08	213,722,000	175.397,000	+21.85
Michigan	3	103.721,000	125,975,000	93,248,000	+35.10	412,302 000	359.944 000	+14.55
Minnesota	4	44.798.000	63.409,000	38,570,000	+64.40	185,849.000	136,997,000	+35.66
Mississippi	6	25.845.000	26,513,000	16,327.000	+62.39	92,440.000	65,430 000	+41.28
Missouri	2	64.975 000	69.229.000	44,487,000	+55.62	242.452.000	169,845,000	+42.75
Montana	5	12.533.000	17.390,000	11.194.000	+55.35	46.726 000	33.556 000	+39.25
Nebraska	5	24.067.000	28.292 000	18.046.000	+56.78	93.907.000	71.378.000	+31.56
Nevada	4	4,121 000	4,720.000	4,072,000	+15.91	16,266,000	14,469,000	+12.42
New Hampshire	4	6 878,000	7,516,000	4,964,000	+51.41	26,826,000	20,540,000	+30.60
New Jersey	3	60.829.000	77,271.000	58 278 000	+32.59	272,406 000	225,394.000	+20.86
New Mexico	5	12.682.000	13 242,000	9 990,000	+32.55	48 585 000	37.323 000	+30.17
New York	4	142,825,000	158,636,000	109,103,000	+45.40	549.956,000	425.266 000	+29.32
North Carolina	6	53 497.000	54,562,000	35,998,000	+51.57	198.961,000	134 064.000	+48.41
North Dakota	4	13,850 000	30 363,000	16 284.000	+86.46	59 280 000	45.047.000	+31.60
Ohio	4	124.188 000	141.546,000	121,948,000	+16.07	477,001,000	436,894,000	+ 9.18
Oklahoma	7½	40.413.000	43.398.000	40.112 000	+ 8.19	154,736 000	180.973 000	—14.50
Oregon	5	26,957.000	31.310.000	20.672,000	+51.46	104.701,090	74.525.000	+40.49
Pennsylvania	4	125.439 000	137,302,000	95.095,000	+44.38	482.164.000	357.381.000	+34.92
Rhode Island	3	10.243 000	11.164 000	9.565,000	+16.72	39 297,000	39.125,000	+ 0.44
South Carolina	6	24.656 000	24.800 000	17.618.000	+40.77	93 646 000	71.021 000	+31.86
South Dakota	4	13,141,000	21,349 000	14,605.000	+46.18	54.783,000	44,952.000	+21.87
Tennessee	7	43.808 000	37.862 000	31.289 000	+21.01	146.203 000	109 564 000	+33.44
Texas	4	*210 066 000	197 656.000	447,536,000	—55.84	*743 492 000	1,620.995.000	—54.13
Utah	4	10.702.000	12 436.000	8,455 000	+47.08	42 043.000	32.098 000	+30.98
Vermont	4	5 000.000	5 572.000	3,440 000	+61.98	19.629 000	13.640.000	+43.91
Virginia	5	44 001.000	47.613.000	36 864 000	+21.16	169.295 000	146.572 000	+15.50
Washington	5	38.667.000	43.408 000	32 209.000	+34.77	150,167.000	114.826.000	+30.78
West Virginia	5	20 470 000	20.786 000	15 685 000	+32 52	77 406.000	54 825 000	+41.19
Wisconsin	4	49 005 000	64.831 000	44.558,000	+45.50	201.455.000	161.159 000	+25.00
Wyoming	4	5,884,000	7,258,000	4,661,000	+61.51	23,958,000	20,795,000	+15.21
Total		2,308,808 000	2,560 288 000	2,179,600 000		8.856 829.000	8,154 913,000	
Daily Average		74,478,000	85,343,000	72,653,000		73,807,000	67,958,000	
Change from previous year:								
Total Change			+380,688 000			701,916 000		
Percentage change in Daily Average			+17.47%			+8.61%		

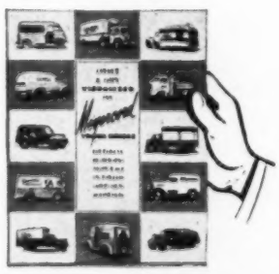
† These are State tax rates per gallon. In addition there is the Federal tax of One and one half cents (1½c) per gallon.
* Revised as follows: January, 179,419,000; February, 156,351,000; March, 210,056,000.

with

MEYERCORD TRUCK DECALS

Colorful advertising on your trucks is a "plus payload". Use it. The space is free. Side panel space is SOLD on some fleets for as high as $240.00 per year per truck. *Your* truck space is certainly worth as much to you! Cab doors, roofs, backs and visors offer extra advertising values, too. For maximum sales appeal on these areas use Meyercord's durable, washable and weather-tested Truck Decals. Colorful product illustrations, trade marks, and lettering can be reproduced at a fraction of hand-painting cost. Overnight application keeps your trucks on the job. Meyercord Decals are economical for a dozen trucks or a thousand.

Learn how your trucks can pay for themselves. Send for full details today. Address inquiries to Department 36-8.



FREE! This Meyercord truck visualizer will help you plan. Send for it today.

THE MEYERCORD CO.

World's Largest Decalcomania Manufacturers

5323 WEST LAKE STREET • • • CHICAGO 44, ILLINOIS

PLANTATION PIPE LINE EXTENSION

FOR SALE or LEASE

Government-Owned pipe line extending from Greensboro, North Carolina to Richmond, Virginia has now been declared surplus ready for disposal.

Property includes an 8-inch pipe line extending over a distance of approximately 179 miles, easements for right-of-way about 30 feet in width for the same distance, four main-line pumping stations, four delivery terminals, employees' residences and other appurtenances. Descriptive brochure will be sent on request.

Immediate Negotiations Invited

Negotiations are invited for use of the line for its designed purpose as an oil carrier and for conversion to the transportation of liquefied petroleum gas, natural gas or other use. Operation at the present site in whole or in part is preferred to removal for relocation elsewhere.

SEND INQUIRIES AND PROPOSAL TO:

Utilities Branch Industrial Division
Office of Real Property Disposal

WAR ASSETS ADMINISTRATION

P. O. Box No. 2707 — Washington 25, D. C.

662

CLASSIFIED

For Sale

FOR SALE: One 7500 gallon train consisting of Federal tractor, 4500 gallon Fruehauf tandem semi, 3000 gallon Fruehauf semi with dolly, vacuum brakes.
One 7000 gallon t.ain consisting of 1945 722 C.O.E. G.M.C. tractor, 4000 gallon Fruehauf semi, 3000 gallon Fruehauf semi with dolly, air brakes. Also 3500 gallon Hi-Way 4-wheeler trailer. This equipment recently overhauled and working every day. Reason for selling, poor health. B. F. Richardson Truck Co., 614 Orange St., Jackson, Michigan.

ALL-BRONZE FOOT VALVES

Immediate delivery on 1" single-poppet, 1½" single-poppet and 1½" double-poppet foot valves and 1½" single-poppet angle check valves. Write for prices.

INDEPENDENT PUMP COMPANY
1250 Getty Street Muskegon, Mich.

OIL JOBBING BUSINESS

Central and Eastern South Dakota area. Two bulk storage plants, 175,000 gal. capacity. Ten retail stations, Twelve wholesale accounts. 1945 gross sales, $255.000. Wonderful opportunity. Client retiring.

T. R. JOHNSON, Attorney
Western Surety Bldg., Sioux Falls, S. D.

FOR IMMEDIATE DELIVERY

Propane TANKS Butane

150 gallon to 1000 gallon complete with fittings.

We design and erect L. P. Gas Bottling Plants.

Municipal L. P. Gas—Air Plants.

KENNEY TANK INSTALLATION CO.
2132 N. Halsted St., Chicago 14, Ill.

FOR SALE

USED

TANK-TRAILERS

4200 to 5168 gallon capacity

All models in excellent condition

TRAILER COMPANY OF LANCASTER
P. O. Box 158
LANCASTER, PENNA.

For Sale

JOBBING BUSINESS

Well established jobbing business in Arkansas averaging seventy five thousand gallons monthly. Eighty thousand gallons storage, large wa ehouse and offices —Stations, Leases, Trucks and equipment. Owner has other business interests.

BOX 81

FOR SALE

One (3) compa:tment, 4500 gallon Fruehauf tandem axle transport unit, good condition. Powered by a K-10 International tractor also in top condition. Will sell as a unit or separate. Ready to go to work. Other units also available. Priced right.

EMERSON OIL COMPANY
Waukesha, Wisconsin

FOR SALE

20—8,000 gallon tank car tanks

200 New 10,000 gallon tank car tanks

4—20,000 gallon steel storage tanks

ROGERS AND WRIGHT
715 Peoples Building
Charleston 26, West Virginia
Phone 30-171

SEMI-TRAILER

1939 Black Diamond 3600 gallon two compartment semi-trailer with 2" lines side delivery. Air or vacuum brakes, new improved spring suspension, two tire carriers, five 1000x20 tires 50% good, new aluminum paint, six spoke steel wheels. Just out of service never wrecked. first $1250.00 buys.

KENDALL OIL COMPANY
1221 E. Main St., Chattanooga 2, Tenn.
Mr. Mayfield, Phone 7-2919

FOR SALE

A 3,000 gallon three compartment Fruehauf semi-trailer equipped with 16 x 6 vacuum brakes and nearly new 900 x 20 tires.

This trailer has just been completely reconditioned and is in excellent shape.

Price $1800.00

THE QUALITY SEAL OIL COMPANY
Saginaw, Michigan

Wanted to Buy

WANTED—Clean 800 or 1000 gallon three compartment truck tank fully equipped. Ice Service Company, Clayton, Delaware.

Wanted to Buy

STEEL STORAGE TANKS

3000 gallons to 25,000 gallons capacity. Must be in good condition.

EMPIRE EQUIPMENT CORPORATION
608 Empire Bldg. Cleveland 14, Ohio
Phone Main 7667

STEEL DRUMS

We buy and sell used empty steel drums at any point. Let us have your offerings. We also sell reconditioned drums.

BUCKEYE COOPERAGE COMPANY
3800 Orange Ave. Cleveland 15, Ohio
Phone Express 3383

Positions Wanted

INDUSTRIAL OIL REPRESENTATIVE desires position covering territory in Connecticut. Has cove.ed all the New England states. Box 82.

SERVICE STATION OPPORTUNITY is sought by well educated veteran, 33. West Coast or Southwest preferred. Experienced in all phases of petroleum marketing and of proven ability. Willing to invest to $5000.00 in either super type station or small marketing organization requiring additional capital or new blood. Box 73.

AVAILABLE RETAIL MARKETING EXECUTIVE

Outstanding record as operating head of large service station chain. Experience includes having planned and directed highly successful, large scale T.B.A. programs, negotiation of supply contracts, dealer t aining and education, selection and training of sales personnel, selection, purchase and lease of retail properties, accounting, warehousing and distribution. Fully qualified to assume complete responsibility for management of your service station marketing activities. Your inquiry will bring detailed personal, business and military history.

BOX 83

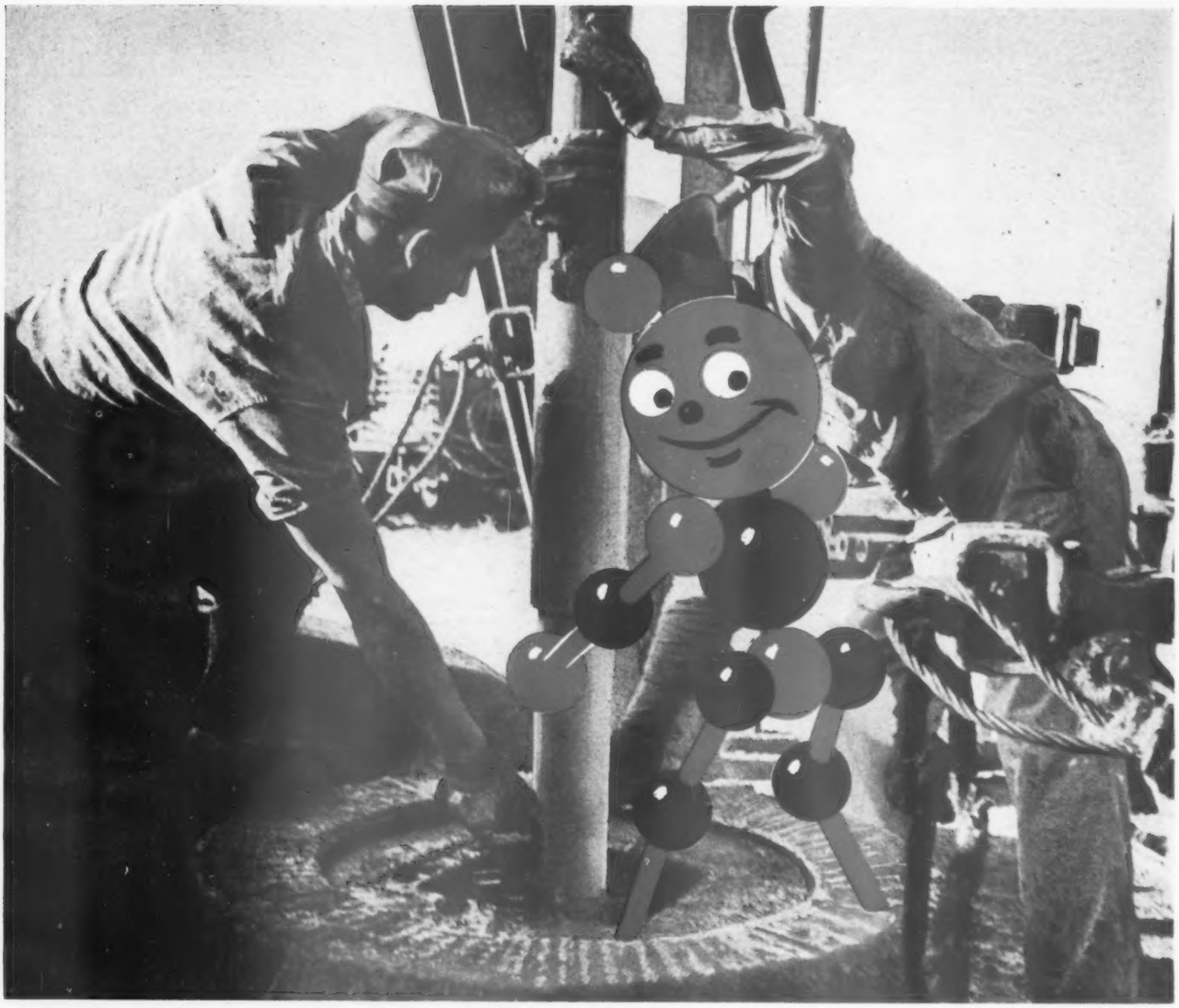
Situations Open

CHEMICAL OR MECHANICAL ENGINEERS

Major oil company requires the services of six to eight experienced chemical or mechanical engineering graduates for its process engineering department. Applicants should be thoroughly familiar with the design of all types of refinery equipment, including pipe stills, thermal and catalytic cracking equipment, lubricating oil refinery equipment, etc., with from four to ten years experience in this type of work. Plant experience desirable. Salary comensurate with experience. Furnish complete outline of technical education, experience, previous employers, salaries received, references, and photograph.

BOX 72

(Continued on Page 71)



Copyright 1946 by Stanco Distributors, Inc.

When you specify **Perbunan**...you get the Right synthetic rubber for your business

Perbunan itself is a product of the oil industry... developed and proved in the great *Esso Research Laboratories* during the early war years. It is made *of* petroleum . . . and it is especially *right* for oil business applications . . . right for *you.*

PERBUNAN is oil-resistant by its very nature . . . won't deteriorate in contact with oil and aromatics.

PERBUNAN can resist high gas pressures at high temperatures . . . won't deform under extreme loads.

Add to these special features Perbunan's high test-ratings for tensile, flexibility, pressure and oven aging, and you'll know why you're being extra-wise, extra-*right* in specifying Perbunan in the rubber parts and products you use.

SPECIFY PERBUNAN for these important rubber parts for oil handling: Oil Suction and Discharge Hose . . . Pump Pistons and Parts . . . Fittings . . . Gaskets . . . Packings. Write us for further information. Stanco Distributors, Inc., 26 Broadway, New York 4, N. Y.

PERBUNAN
REG. U. S. PAT. OFF.

MADE OF PETROLEUM...BY A PETROLEUM COMPANY...FOR THE PETROLEUM INDUSTRY

ABOUT OIL PEOPLE

Mr. Howe

The oldest oil company in America, an Independent, has one of the youngest vice presidents of any of the country's large distributors. . . . He is 39-year old **Kenneth T. Howe,** recently made vice president of Boston's Jenny Manufacturing Co. . . . He was formerly sales manager for this company, now distributing Aero gasoline and a complete line of petroleum products . . . Company was founded in 1812 . . . In those days, as now, competition was keen . . . Whale oil was the main line.

° ° °

Aug. 1 Jay Oil Co., Shellman, Ga., became Puckett Oil Co. . . . **W. R. Puckett** is the owner . . . He purchased the business March 1, '44, but for various reasons continued to operate under old name until now . . . Company is planning several new stations when material and equipment becomes available . . . In past year it has built one new station . . . It has also added eight new pumps and tanks, four new air compressors, 12 new skid tanks and one new truck . . . Most recent improvement in operations, Mr. Puckett says, is the addition of new meters on all bulk tanks and delivery trucks . . . Company has added a new line of tires and lubricants . . . Two ex-servicemen with plenty of service ribbons have been added . . . They are **Cecil D. (Red) Mims,** three years in Army, two of them overseas, and **R. G. Puckett,** two years in the Navy, eight months of which were in the Pacific.

° ° °

Walter G. Berger, better known as "Walt," is now a pappy . . . She arrived July 26 . . . He is a member of NPN's field advertising staff

° ° °

The man who pioneered in sea-water chemistry, and president of the company which extracts bromine from sea water for use as an ingredient of Ethyl fluid, has been awarded the chemical industry medal for 1946 . . . He is **Dr. Willard H. Dow,** president and chairman of Dow Chemical Co., Midland, Mich. . . . Under his direction, the company he heads carried out for the government and armed forces more than 50 major wartime projects involving magnesium, styrene for synthetic rubber, high octane gasoline and basic chemicals used for manufacturing munitions . . . The chemical industry medal will be presented Nov. 8 at Hotel Commodore in New York . . . It is the third high scientific award won in recent years by Dr. Dow . . . He is a director of the American Chemical Society . . . The award cites Dr. Dow for his "conspicuous service to applied chemistry."

Prof. P. G. Murdoch, department of chemical engineering, Texas Agricultural and Mechanical College of Texas, at College Station, Texas, is busy on arrangements for Texas A. & M's. first short course on "Instrumentation for the Process Industries". . . .It will be Sept. 4, 5, 6. . . . It will be conducted as a seminar with lectures and discussion on the subject of automatic control. . . . . Many industrial concerns manufacturing oil, gas, and chemical products are cooperating. . . . There will be educational exhibits and capable lecturers. . . .Anyone is eligible for the course upon payment of $5 registration fee. . . . Rooming accommodations and meals will be available on the campus at college dormitories and mess halls at reasonable price. . . . Banquet and entertainment is planned. . . Prof. Murdoch will be glad to furnish further information.

° ° °

G. Howie Losezem is now working for Indiana Independent Petroleum Assn. . . . He is the eminent author of "How to Lose Sales". . . .His latest work "How to Lose Customers" is being offered to IIPA members. . . . It is composed of several simple lessons. . . Among techniques recommended is chewing a large wad of gum, using a snarly tone and a belligerent expression, putting on a dead pan when customers appear . . . **George Hofmayer,** association secretary, believes the booklet will produce more courteous service at station and dealer outlets.

° ° °

Zed C. Reddish, Chicago district sales manager for Socony-Vacuum, who had his gall bladder removed at Evanston hospital on July 25, was able to return home last week. He expects to be back in office harness shortly.

° ° °

Ralph E. Kampmeier is now located in Cleveland. . . . He is the new assistant district manager for Sinclair for Northern Ohio. . . . **R. L. Taylor,** Columbus, is assistant district manager for the southern part of Ohio. . . . Mr. Kampmeier was formerly in charge of Sinclair's operations in Illinois with exception of metropolitan Chicago. . . . **George J. Spellman,** formerly general agent in Cleveland is now in charge of the company's real estate operations in Ohio. . . . **W. H. Loughran,** formerly assistant general agent, Cleveland, is now in charge of Cleveland operations.

° ° °

William E. Johnson is now in the oil business in San Diego, Calif. . . . He was formerly a jobber in DuQuoin, Ill.

° ° °

"Watch Us Grow" could be a slogan that really means something for Consumers Supply Co. . . . This Independent in Des Moines, Iowa, is headed by **E. C. Muelhaupt,** president, and **M. P. Underwood,** manager of sales . . . Sept. 15, com-

CLASSIFIED

Situations Open

LICENSED CIVIL ENGINEER

With sufficient experience to qualify for position as operating-construction engineer. To help organize and supervise construction department for large oil company.

BOX 74

SALES MANAGER

Independent Oil Company, Retail marketing, Houston area, Capable of handling small sales force.

BOX 69

Classified Rates

"For Sale," "Wanted to Buy," "Help Wanted," "Business Opportunities," "Miscellaneous" classifications, set in type this size without border—15 cents a word. Minimum charge, $4.00 per insertion.

"Position Wanted"—10 cents a word. Minimum charge $1.50 per insertion.

Advertisements set in special type or with border—$5.00 per column inch.

Copy must reach us not later than Wednesday preceding date of issue.

All classified advertisements are payable in advance.

No agency commission or cash discounts on classified Advertisements.

ADVERTISERS' INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate but National Petroleum News assumes no responsibility for errors or omissions.

Battenfeld Grease & Oil Corp. 33
Brodie Co., Inc., Ralph N. ..Inside Front Cover
Brown Steel Tank Co. 31
Butler Mfg. Co. 36, 37
Chevrolet Motor Division, General Motors Corp. 26, 27
Continental Can Co. 21
Crane Co. 35
Goodyear Tire & Rubber Co. 46
Industrial Raw Materials Corp. 54
Jones & Laughlin Steel Corp. 51
Kellogg Co., M. W. 22
Kidde & Co., Inc., Walter 43
McDonald Mfg. Co., A. Y. 49
Meyercord Co. 67
National Petroleum News 54
National Pumps Corp. .....Inside Back Cover
Neptune Meter Co. 2
New York Lubricating Oil Co. 47
Pennsylvania Grade Crude Oil Assn. 45
Pharis Tire & Rubber Co. 8
Philadelphia Valve Co. 65
Rieke Metal Products Corp. 1
Scully Signal Co. 4
Shell Oil Co. 6
Sinclair Refining Co. 40, 41
Sonneborn Sons, Inc. L. 48
Stanco Distributors, Inc. (Perbunan) 70
Standard Steel Works ....Outside Back Cover
Timken-Detroit Axle Co. 53
U. S. Industrial Chemicals, Inc. 38
United States Steel Corp. 25
United States Steel Products Co. 25
War Assets Corp. 68

pany will move into a new brick 66 x 130 two-story building in Des Moines . . . It will contain office, display room, warehousing space, including bulk oil storage . . . Building is being equipped with hydraulic elevator . . . Display room of home appliances will contain hundreds of items, including radios and washing machines . . . Retail prices are marked on each item, and also the dealer's cost in code . . . This enables Consumers dealers to actively sell the complete line where handicapped for space at his own location . . . Consumers Supply is strictly wholesale . . . It is state distributor for Barnsdall products . . . In smaller areas distributes national brands of oil, batteries, tires, antifreeze, radios, washing machines and other items . . . Company is also completing a 40 x 60 concrete block building at its Clear Lake, Iowa, branch to give this same type of service . . . Ex G. I. **Barry Plumb** is in charge there.

° ° °

Harry M. Carruth is now making his permanent home in Tryon, south of Ashville, N. C. . . . He purchased a home there two years ago looking to the time he would give up his active connection with the oil industry . . . He retired as vice president of Canfield Oil Co., Cleveland, last December after being with the company for 45 years . . . He started when kerosine sales were a big part of Canfield's business.

° ° °

Imagine his surprise when former Lieutenant Colonel **Thomas J. Rouzie** saw his picture in a recent issue of the *Saturday Evening Post* . . . He didn't even know the picture, showing him talking with **Maj. Gen. Anthony Clement McAuliffe** shortly before the Allied invasion of Holland, had been taken . . . He is Standard Oil (Ky.) cashier in the Jacksonville, Fla., office.

° ° °

Charles M. Hilliard too busy for the past 43 years to enjoy the wonders of Florida, has called it a day and retired to find what it is like to be a man of leisure . . . He was manager of Gulf's Florida fuel and gas oil department, and was the oldest Gulf employe, in point of service, in the Southwest. . . . **J. A. Guyton**, assistant division manager of fuel oil sales in Atlanta, is taking care of Mr. Hilliard's work at present.

° ° °

More competition in West Virginia . . . **Etley P. Smith, Jr., Virginia H. Smith** and **C. H. Hardesty** have incorporated Suncrest Supply Co. at Fairmont . . . Company will engage in the petroleum and accessories business.

° ° °

William P. Evans is now general manager for Imperial Oil and Service Co. . . . This Independent with extensive operations in the city of Scranton, Pa., and surrounding areas, has just added a new line of tires and batteries . . . Company is taking on all available associated lines of accessories . . . This Atlantic Renining distributor recently added a new truck . . . Mr. Evans was with Atlantic for 16 years . . . He was sales representative for distributors, jobbers, and tank car accounts.

° ° °

J. G. Campbell has a new job with a new department of Shell Oil Co. in New York. . . . He heads the newly established economics and statistic department. . . . He reports to **E. C. Peet**, vice president and treasurer. . . . Department will conduct both general and specific research in the field of economics for management's guidance. . . . It will also correlate, analyze and interpret the statistical, financial and operating reports and data of Shell's various operating departments. . . . .Campbell before being appointed to this position was in personnel work for Shell after spending 13½ months in the Navy as deck, division and watch officer and taking part in six operations. . . . He joined Shell in '41 where he did statistical work and was secretary of the crude oil supply committee and employment representative for college graduates.

° ° °

Rex McFall is back in Midland, Tex. . . . He is Superior Oil Co. geologist . . . For three months he was engaged in drilling work in the Bahamas Islands.

° ° °

Jack McCall is now scouting for Standard Oil Co. of Texas. . . . He has just finished his job in the Army Air Service as a lietenant colonel.

° ° °

New department commander of the Mississippi American Legion is **H. M. Morse**. . . . He is supervisor of the Mississippi state Oil and Gas Board. . . . He has had that job since 1938. . . . Before that he was assistant state geologist at the University of Mississippi. . . . He is a World War I Navy man.

° ° °

Ark-La-Tex Landmens Assn. has named **Charles T. McCord, Jr.**, Shreveport, as president. . . . The association is composed of oil and gas company men in the tri-state area. . . . Other officers are: **Charles W. Day, Jr.**, vice president; **Jack Hamilton**, secretary-treasurer; and **Lon Mason, T. C. Patterson, L. S. McGee, F. H. Harrell** and **J. W. Loonce**, executive committee members.

° ° °

Gwin and Gwin are going to "gwin and bear it" . . . These brothers, **J. T.** and **Alma W.**, are now distributing Pan American Petroleum Corp.'s products in Greenwood, Miss., under the name of **Gwin & Gwin.**

° ° °

Wright Bros. — Ernest and Everet — Graham, Mo., have a modern lubritorium under construction. . . . They are also adding new equipment for automotive brake and electrical service. . . . They also have a 200-locker cold storage system, a meat market and a modern grocery store.

° ° °

Credit executive **J. A. Walker** of Standard Oil Co. of California has been receiving steady promotions since 1934 when he was appointed assistant district credit manager in Los Angeles. . . . This was followed by becoming credit manager at Medford in 1937; home office credit specialist in 1939; district credit manager in San Francisco in 1940; assistant manager of the credit department, home office in 1943. . . . Now he has been appointed manager of the credit department. . . . About a year ago he wrote a book for the company's marketing and credit people called "What Would You Say?" . . . . A sound picture was made from the book. . . . Book and film are now used in 21 colleges and universities in many large companies.

° ° °

Elks Oil Co., Tuscaloosa, Ala., since the return of the owner's son, **Herman F. Burchfield, Jr.**, from four years service in the Pacific (he is manager of the company's TBA department), recently added a new line of tires, batteries, lubricants and accessories, which are being sold on a commission basis by employes . . . Company now has three bulk plants . . . They are at Tuscaloosa, Greene and Pickens . . . Biggest deal recently was the purchase by **H. F. Burchfield,** owner, of the half interest of **J. P. Burchfield, Jr.**

° ° °

Business is really picking up for Gabbert Oil Co., Senatobia, Miss. . . . That company, of which **J. T. Gabbert** is president, in the past year has added one 32,000-gal. bulk plant . . . But the biggest improvement has been the addition of two new truck tanks and transport with pumps and meters . . . In addition three service stations are in the postwar works; a pickup truck will be added when available, and 10 farm tanks have been added in the past six months . . . Company has also taken on a new line of tires to sell.

° ° °

Wanted: One legged golf player . . . This appeal was recently made by **Carl Heitzler**, Canton Refining Co. . . . Seems he won three pair of special golf wool hose at the Chicago Oil Men's tournament . . . Five socks disappeared at the 19th hole . . . The remaining one is now in the hands of Canton's salesmanager, **Vic Wiseman**, Cleveland 13, Ohio.

° ° °

No use to go to Minnesota for fishing this season . . . **Emmett Farmer,** Capitol Oil Co., Camby, Ind., has already been . . . He was accompanied by his family.

° ° °

Kentucky Petroleum Marketers Assn. has been blacklisted by **Senator Claghorn** . . . Reason was recent announcement that the colonels would hold their annual golf tournament at French Lick Springs, Ind., sixty miles north of the Smith & Wesson line.

Attractive by Day . . . Attract at Night

Install National A-38L
Wide-Arc Island Liter Pumps.
See how the broad diffusion of illumination
lights up your pump, island and driveway,
emphasizes your brand name display, and
attracts customers to your station after dark!

National's "Island Liter"
saves space . . .
costs far less
than separate light posts.
Can be easily installed in the field on
National A-38, A-38H and B-38 pumps.
Easy to attach,
National's Island Liters become
an integral part of your pumps.
Available in colors to match.
They cost only $19.73 Eastern price;
$20.71 Pacific coast price,
with new National pumps
or for your present National pumps.

NATIONAL PUMPS CORPORATION

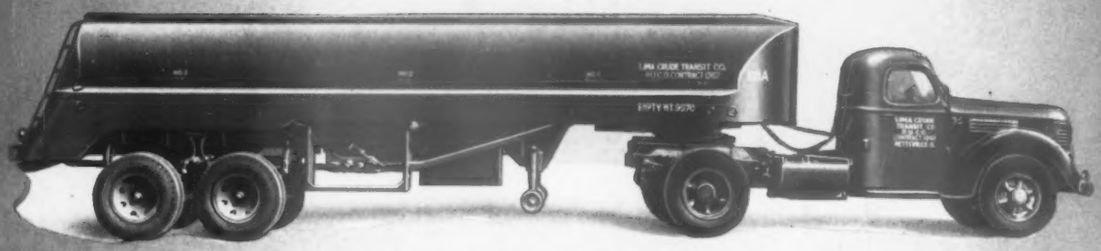
General Offices: CINCINNATI 23, OHIO
Factory: DAYTON 1, OHIO
Pacific Coast Division Office: 1190 28th St., Oakland, Cal.
Branch Office: 937 Santa Fe Avenue, Los Angeles, Cal.

A GOOD NAME
A GOOD PRODUCT
A GOOD COMPANY

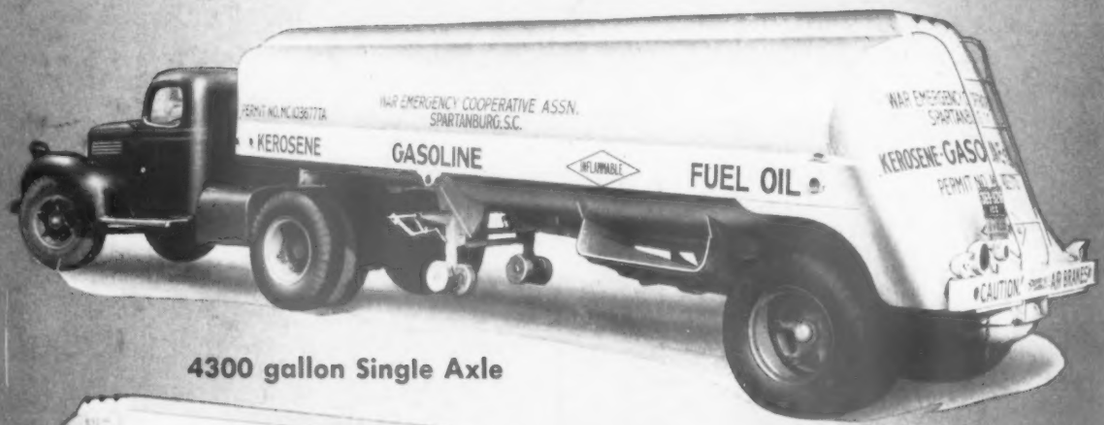
NATIONAL A-38L
"ISLAND-LITER"

HAUL A REAL PAY-LOAD

8000 gallon Train



5220 gallon Tandem



4300 gallon Single Axle

8000 gallon Train for states with short overall length limitations

Other Products:

ASPHALT DISTRIBUTORS • TAR KETTLES • MAINTENANCE DISTRIBUTORS • BURNERS STREET FLUSHERS • SPRAY UNITS • SUPPLY TANKS SURFACE HEATERS • SHOULDER ROLLERS . . . and Agricultural Equipment.

Write today for legal limits and maximum allowables for your operation.

Standard Steel Works

NORTH KANSAS CITY, MO., U.S.A.

PUBLIC LIBRARY
AUG 9 - 1946
DETROIT

NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to

REFINERY MANAGEMENT and PETROLEUM CHEMICAL TECHNOLOGY

Section Two | August 7, 1946 | Vol. 38, No. 32

$750,000 MODERNIZATION STREAMLINES AN 18,000 BBL. REFINERY

REVAMPING and modernizing this 18,000 b/d refinery of Cosden Petroleum Corp. at Big Spring, Texas, included a new crude heater (long furnace in center of photo), the hot clay heater immediately above it, and a new water softener to the extreme left. Fractionating equipment to the right of the new clay heater was completely revamped when two old toppers were consolidated. A new Unisol unit (not visible) was also added, and is located to the right of the cooling tower in the upper righthand corner. For full details see pg. R-570.

Quality

IN DESIGN • MATERIALS • WORKMANSHIP

The quality built into HUDSON Towers assures the operator of minimum overall cost to cool water over the life of the process unit.

HUDSON ENGINEERING CORPORATION

Engineers and Constructors

FAIRVIEW STATION HOUSTON, TEXAS

HUDSON COOLING TOWERS

MECHANICAL AND NATURAL DRAFT

Contents

National Petroleum News, TECHNICAL SECTION

Vol. 38, No. 32—Aug. 7, 1946

Refinery Equipment

Plant Practices . . . for Refinery Superintendents and Foremen ..... R-577★

Corrosion Limits Metals that Can Be Used for Construction of HF Alkylation Units R-618

Plant Operation

18,000 b/d Refinery Spends $750,000 to Remodel Facilities, Improve Products ..... R-570★

Refinery Wastes Can Stop Oxygen Supply, Causing Water Pollution and Killing Life (No. 8 in a series) R-587★
By W. B. Hart

Germany Made Acetylene and Carbon Black by Cracking Natural Gas in Electric Arc R-596
By E. S. Pettyjohn

Cut Corrosion Costs! R-637
By F. A. Rohrman

Plant Design

Composition of Raffinate and Extract Layers in Selective Solvent Refining ..... R-613★
By V. A. Kalichevsky

Principles of Reactor Design
Article 4—Toluene from Benzene plus Xylenes ..... R-629★
By L. N. Johanson and K. M. Watson

Petroleum Products

Coal-Burning Gas Turbine Locomotives May Supplant Diesel-Electrics ..... R-563★

Economics Studies on Coal-Burning Gas Turbine Locomotives Show Interesting Cost Comparisons ..... R-566★

Production of Synthetic Lubrication Oil by Condensation and Polymerization ..... R-606★
By George G. Pritzker

Departments

Tomorrow in Petroleum Technology ..... R-567★

Patent Trends in Petroleum Refining ..... R-584★
By Peter J. Gaylor

New Books for the Oil Man R-635

Petroleum Technologists in the Headlines R-638

Widening Horizons ..... R-640★

"Consolidate Oil Companies Attack on Refinery Corrosion Losses"

"NPN's Technical Section Becomes PETROLEUM PROCESSING"

★ EXCLUSIVE in the NPN Technical Section

Published Every Month by

The National Petroleum Publishing Company

Publication Office, 1213 West Third Street, Cleveland 13, Ohio, U. S. A.

V. B. Guthrie, Editor, Technical Section

D. P. Thornton, Jr., Assistant Editor • William F. Bland, Engineering Editor

TECHNICAL MEETINGS FOR OIL MEN

August

22-24, Society of Automotive Engineers, West Coast Transportation & Maintenance meeting, Hotel New Washington, Seattle, Wash.

25-28, American Institute of Chemical Engineers, Western convention, Palace Hotel, San Francisco.

September

9-13, American Chemical Society, 110th Annual meeting, Chicago.

10-14, 4th National Chemical Exposition, Coliseum, Chicago.

16-20, National Instrument Conference, sponsored by the Instrument Society of America, Wm. Penn Hotel, Pittsburgh.

18-20, National Petroleum Association, 44th Annual meeting, Hotel Traymore, Atlantic City, N. J.

23-25, National Butane-Propane Assn., annual convention, Continental Hotel, Chicago.

29-Oct. 2, National Lubricating Grease Institute, 14th Annual meeting, Edgewater Beach Hotel, Chicago.

30-Oct. 3, The American Society of Mechanical Engineers, Fall meeting, Hotel Statler, Boston.

October

3-5, Petroleum Division, American Institute of Mining and Metallurgical Engineers, Fall meeting, Galvez Hotel, Galveston.

7-11, 34th National Safety Congress and exposition, sponsored by the National Safety Council, Stevens Hotel, Petroleum Section, Congress Hotel, Chicago.

11th, California Natural Gas Association, 21st Annual meeting, Ambassador Hotel, Los Angeles.

7-12, American Gas Association, Annual meeting, Atlantic City, N. J.

24-25, Petroleum Fuels Division of the American Institute of Mining and Metallurgical Engineers, Ambassador Hotel, Los Angeles.

November

7-8, Society of Automotive Engineers, National Fuels and Lubricants meeting, Mayo Hotel, Tulsa.

11-14, American Petroleum Institute, Annual meeting, Stevens Hotel, Chicago.

17-20, American Institute of Chemical Engineers, Annual meeting, Bellevue-Stratford Hotel, Philadelphia.

18-22, American Society for Metals, Annual Metal Congress and Exposition, Municipal Auditorium, Atlantic City, N. J.

21-22, American Standards Association, Annual meeting, Waldorf-Astoria, New York.

December

2-6, American Society of Mechanical Engineers, Annual meeting, Hotel Pennsylvania, New York.

2-7, 17th National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.

1947

January

6-10, Society of Automotive Engineers, Annual meeting and Engineering display, Book Cadillac Hotel, Detroit.

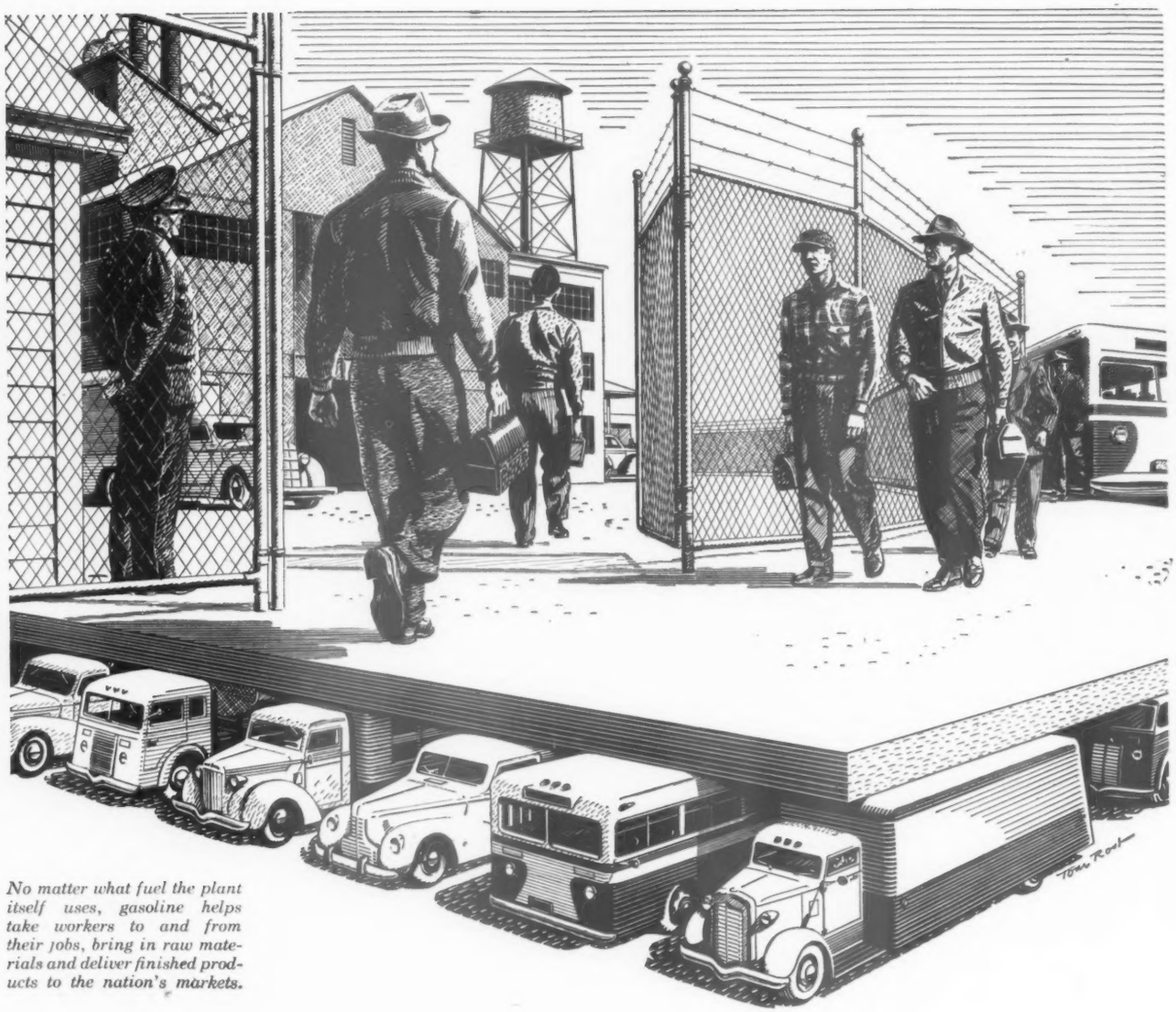
March

17-22, American Institute of Mining and Metallurgical Engineers, Annual meeting, Technical Section meeting, March 20-22, New York.

22-28, American Society for Metals, Western metals congress and exposition, Civic Auditorium, San Francisco.

April

7-10, National Association of Corrosion Engineers, Palmer House, Chicago.



No matter what fuel the plant itself uses, gasoline helps take workers to and from their jobs, bring in raw materials and deliver finished products to the nation's markets.

Industry runs on gasoline

IT WOULD be impossible to draw a complete picture of modern industry without including cars, trucks, buses and other types of gasoline-powered equipment. Gasoline transportation is so much a part of the American industrial scene that *everyone* benefits each time its cost is reduced.

During the past twenty years such reductions have been many. By improving their refining processes and using antiknock fluid made by Ethyl, oil refiners have been able to produce gasolines of increasingly higher quality. And each improvement in gasoline has in turn made possible the development of more powerful, more efficient engines to provide better transportation at lower cost.

Because better fuels and better engines depend so much upon each other, Ethyl's research and service organizations have always worked closely both with refiners who use our product and with engine builders who are eager to get the most out of every improvement in gasoline quality. Ethyl Corporation, Chrysler Building, New York 17, N. Y.

More power from every gallon of gasoline through

ETHYL

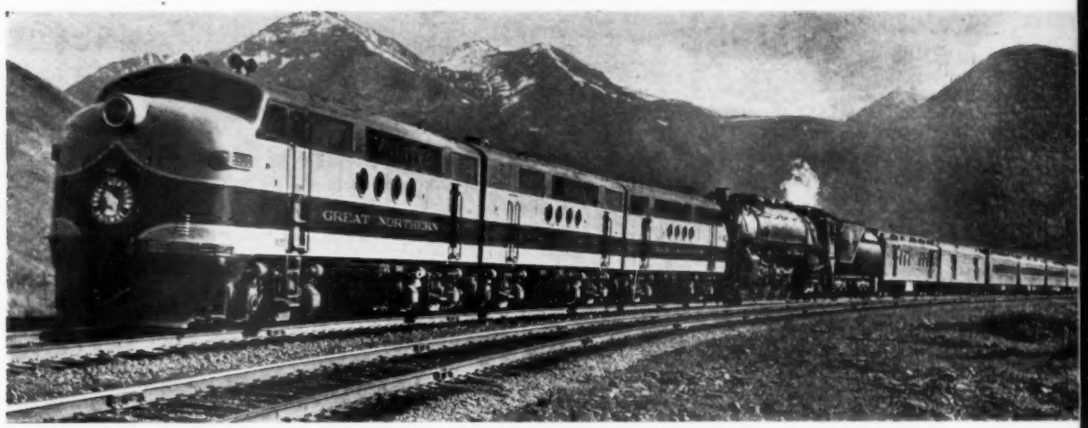
Research · Service · Products

REFINERY MANAGEMENT *and*
PETROLEUM CHEMICAL TECHNOLOGY

August 7, 1946
Volume 38
Number 32

MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

FUEL OIL UTILIZATION



A 4050-hp Diesel tows the Great Northern Empire Builder over Montana's Rockies

Coal-Burning Gas Turbine Locomotives May Supplant Diesel-Electrics

Replacement of Oil-Fueled Diesels Is Aim of Joint Research Project of Railroad and Coal Companies, Which Has Already Announced Revolutionary Design of Turbine-Powered Unit

Pulverized coal-burning, gas turbine-powered locomotives, as well as improved designs in steam locomotives greatly improving their efficiency, threaten the growth of the use of Diesel power by the nation's railroads.

The coal-burning gas turbine power plant for locomotives is the result of work to date in a research program sponsored by the Locomotive Development Committee of the Bituminous Coal Institute. The first locomotive of this type will be built and experimental tests inaugurated this year.

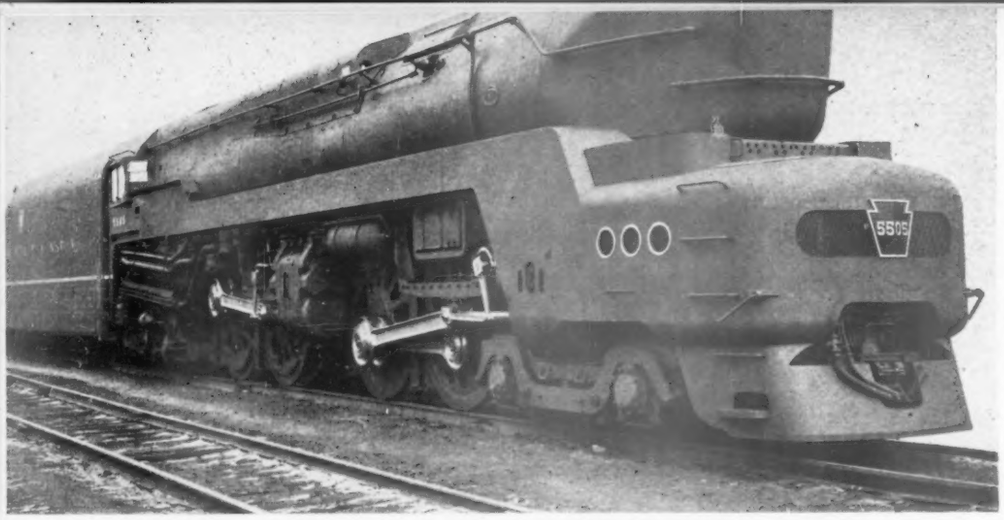
The Locomotive Development Committee is composed of representatives from six important railroad systems and three large coal producing companies. The six railroads are all eastern lines which derive a good share of their revenue from moving coal. Research work on the coal-burning gas turbine for locomotives is being carried on at Bituminous Coal Research Inc. laboratories at Johns Hopkins University; Battelle Memorial Institute, Columbus, O. and the Institute of Gas Technology, Chicago.

In improved designs in reciprocating steam locomotives, the Pennsylvania Railroad has been in the lead in development work. It already has 50 passenger type engines of new design in service and expects early delivery of 25 freight engines of similar design. Greatly improved performance records are being made by these engines. (See page R-566).

The coal-burning turbine would combine low fuel cost with the high starting power of the Diesel-electric. Based on fuel cost alone, 9.8c per mile using powdered coal to power a gas turbine as against 30.4c per mile where using oil as fuel for Diesels, a great saving for the former is shown by the coal research bureau. In efficiency in operation, however, the Diesel-electric is shown to rate higher. Actual comparative cost data on other factors, such as time on the road and others, will not be available until service tests on experimental units of the coal-burning gas turbine are completed.

Railroad executives naturally are keen for the use of coal as a fuel to drive their locomotives if it is economically practicable. Coal supplies 900 million dollars of the railroads' annual revenue, while petroleum supplies only about 37 millions, and this has been dwindling as the oil companies turned to pipelines, barges, tankers, and trucks to move their materials from the well to the market. On the other hand, the growth of Diesel locomotives using oil for fuel has been phenomenal in recent years. In 1944, the railroads purchased 680 Diesels as against 74 steamers; last year the figure was 702 Diesels and 148 steamers; and for about the first six months of this year, Diesels numbered 516 out of a total of 585 new locomotive purchases.

"Most of the railroads of the country are looking about eagerly for a prime mover which can burn coal and yet produce operating costs which are better



The Pennsylvania T-1, latest type of reciprocating steam locomotive. Equipped with roller bearings and with poppet valves for better steam distribution, this four-cylinder single expansion locomotive develops an efficiency of between 6 and 8% and has hauled a full-length passenger train at 100 mph. Almost 50 class T-1's are now in service on lines west of Harrisburg

than those of the Diesel-electric combination," John I. Yellott, Director of Research of the Locomotive Development Committee, stated in a paper presented before the American Mining Congress, Cincinnati April 29, 1946. He continued:

"The most recent development in the art of steam locomotive construction has produced a locomotive of outstanding performance which can, with the present relative prices of oil and coal, provide rail horsepower hours more cheaply than the Diesel."

Looking ahead for a decade or so, the railroads foresee the threat of an oil shortage as another important economic reason for this research program. According to an estimate of the nation's fuel reserves by the Bituminous Coal Institute, the supply of coal is virtually limitless—about 3000 years. Oil, however, may be depleted in 10 to 15 years, the coal men believe and natural gas in about 32 years. These figures, of course, are open to considerable discussion. Authorities in the oil industry will challenge these predictions of the coal industry as to when the supply of petroleum and gas will be exhausted.

Top executives of the following coal and rail companies constitute the Locomotive Development Committee: New York Central System, Pennsylvania Railroad, Baltimore & Ohio, Chesapeake & Ohio, Louisville & Nashville, Norfolk & Western, M. A. Hanna Co., Island Creek Coal Co. and the Sinclair Coal Co.

Its two-year development program is being carried on in engineering studies at Johns Hopkins University, Battelle Memorial Institute, and the Institute of Gas Technology. Construction of models and full-scale experimental units is being made by several leading locomotive and power plant manufacturers. (See Fig. 1)

"Large-scale combustion tests under full gas turbine pressure will be carried out during the coming summer in cooperation with the American Locomotive Co. at their Dunkirk plant," Mr. Yellott explained in his paper, "In this installation, all of the necessary coal-handling equipment for a full-sized locomotive will be installed within a space similar in floor plan to a locomotive."

Before a gas turbine can be made to burn coal, provision must be made for three major necessities. These are, as pointed out by Mr. Yellott:

1. The coal must be prepared and supplied to the combustor at the correct size and rate.

2. The coal must be ignited and burned without slag at a rate exceeding 1,000,000 BTU per cu. ft. per hour.

3. The fly ash must be removed almost completely from the hot air.

"The most practical way to burn coal in a pressurized combustor is to pulverize it and burn it in suspension.

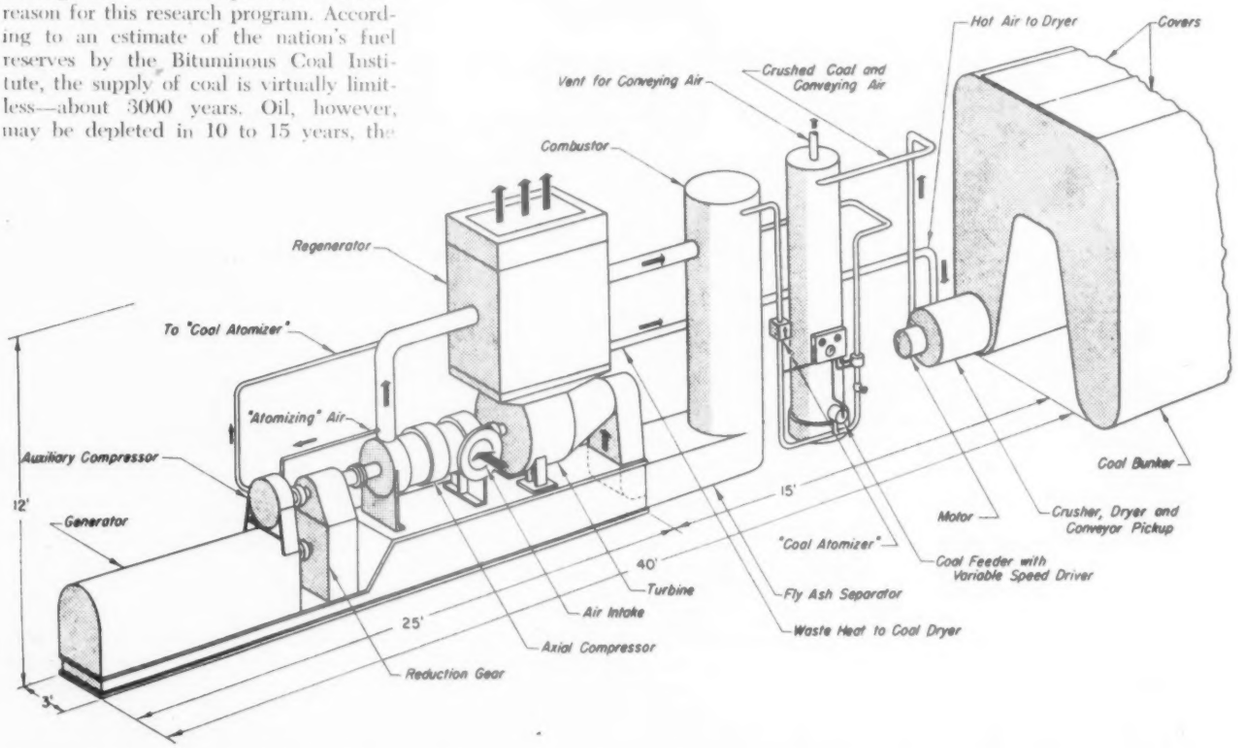


Fig. 1—Schematic view of the relative positions of the various parts of a coal-burning gas turbine locomotive power unit. Except for coal bunker, which can be the full width of the locomotive, the entire unit including generator occupies a space only 3 ft. wide, 12 ft. high and approximately 40 ft. long

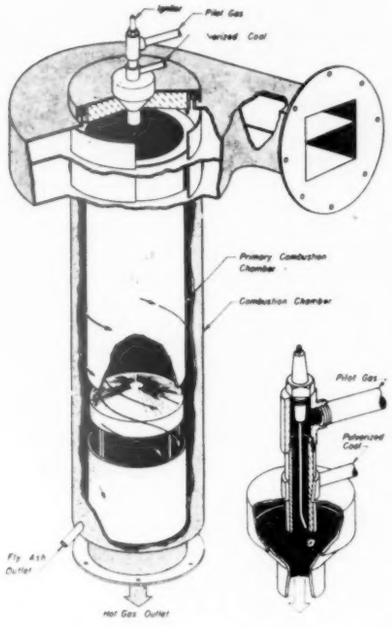


Fig. 2—The hot gas which actuates the turbine is produced by the burning of the pulverized coal in this specially designed combustor. Coal enters through ignitor nozzle at top, and is burned in rapidly rotating air stream which was admitted to chamber through tangential ports from duct surrounding top portion of apparatus

"In order to insure the reliability of the equipment, it is necessary to dry the coal to as low a moisture content as can be reasonably attained. The gas turbine itself could burn wet coal without serious difficulty, but the feeding equipment requires dry coal for proper operation. Fortunately, virtually inexhaustible supplies of hot air are available for this purpose from the turbine exhaust, at a maximum temperature of about 600° F. It is proposed that the coal from the bunker (see Fig.1) be conveyed by air to the tank where it will be put under pressure and fed into the combustor through a novel type of 'coal atomizer'. This use of a pneumatic conveying system will mean that the bunker can be placed in any convenient location, at either end or in the center of the locomotive.

"A draw-through system will be used, in which the necessary suction will be applied to the vent line of the coal-tank, and in this manner all of the coal-handling system will be at a pressure slightly below atomospheric. This will have the advantage of preventing the leakage of fine coal into the cab. It is proposed to start the drying process in the bunker by admitting warm air at the top and allowing it to permeate down through the coal. In addition, warm air will be supplied to the screw feed which carries the coal into the crusher. The crusher will also be swept with warm air, aiding in the drying process and picking up coal which has been crushed and screened to a —10 mesh size.

"The coal will be separated from the conveying air by an internal cyclone at the top of the pressure tank. The suction fan will incorporate means for removing the fine coal which has escaped from the pressure tank, and discharging these fines back into an earlier stage of the coal-handling system.

"The crushed and dried coal must be pressurized so that it can be fed into the higher pressure air line through which it will be carried to the coal atomizer and into the combustor. Several means of pressurizing the crushed coal are under consideration. The simplest means would be to use twin tanks, so that one can be under pressure and feeding coal to the combustor while the other is receiving crushed coal.

"A second method is to force the coal through an upwardly inclined screw feeder, which is caused to run full and to maintain a continuous sealing plug of coal at its high pressure end. This divice is now under development by the Committee, and it has already demonstrated its ability to force coal against a pressure head of 75 psi, with the screw feed turning at 175 rpm.

"Still a third method of pressurizing is through the use of a lock hopper system, such as the sand blast industry has used for many years.

Feed Screw is Throttle

"The coal will be fed from the pressure tank by means of a small screw feeder, the speed of which will be varied mechanically. Essentially, this will be the throttle of the locomotive, because the power output of the turbine is directly proportional to the temperature of the hot gas, and this temperature is again dependent upon the rate fuel is fed to the combustor.

"The pulverization of the coal is accomplished by passing it through a nozzle with the compressed air which is carrying it. By causing a sudden pressure drop, the air which is trapped in the pores of the coal creates an internal explosion, shattering each particle into a great number of smaller fragments. A fineness of 70% smaller than a 325 mesh screen can be attained, using about 1 lb. of air per lb. of coal. This coal atomizer, developed by the Institue of Gas Technology, is particularly well suited to the needs of the gas turbine, because the additional air pressure essential to pulverization can be obtained from a simple booster compressor, drawing its air supply from the discharge of the main compressor (see Fig. 1).

"Very little work had been done on the combustion of coal under pressure until the program of the Locomotive Development Committee was undertaken. As a part of this program, work is now being carried on at Battelle Institute to obtain for pressurized combustion the same fundamental information which that institution has already published on atmospheric combustion.

"The goal is a non-slagging combustor which will have a heat release of at least 1,000,000 BTU per hr. per cu ft. In the laboratory at Johns Hopkins University, a complete coal-handling system has been installed, with an atmospheric pressure combustor in which about 100 lbs. of coal can be burned per hour. This unit has been operated continuously for long periods without the formation of slag, and estimated heat releases approach the value being sought. The coal is introduced into the center of a rotating stream of air in the combustion section (see Fig. 2), and is ignited by an electric spark and a propane flame. After the unit has come up to temperature the propane can be cut off and the coal will continue to burn. The cooling air is circulated through the annular space between the stainless steel inner shell and the ordinary carbon steel outer shell. Freedom from slag is probably due to the fact that the coal particles do not contact a metal wall until they have become chilled below the ash fusion temperature. Much work remains to be done on the control of the combustor, because a variation of fuel input over a 4 to 1

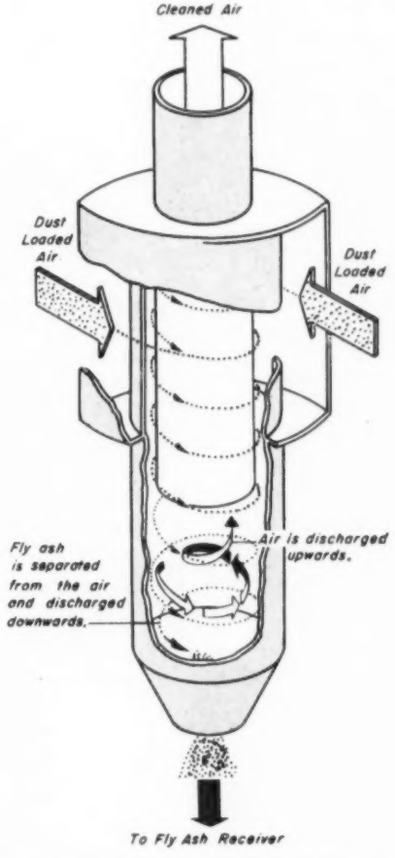

Cleaned Air
Dust Loaded Air
Dust Loaded Air
Air is discharged upwards.
Fly ash is separated from the air and discharged downwards.
To Fly Ash Receiver

Fig. 3—Device for removal of approximately 95% of fly ash. A large number of these small tubes would be installed in parallel between the combustor and the turbine

range is necessary to enable the turbine to run from idling to full load.

"A large number of cyclone separators will be used to accomplish the removal of the ever-present fly ash. These tubes, produced by the Aerotec Co. (see Fig. 3), have been subjected to elaborate tests at the Institute of Gas Technology, and have demonstrated their ability to remove as much as 95% of a very fine fly ash. These tubes were originally designed as aircraft and tank carburetor cleaners for desert warfare. Although the capacity of a single tube is limited, a large number can easily be put in parallel. No final decision has been reached as to the disposition of the fly ash, but the quantity caught will not be so great that it could not be carried in tanks on the actual locomotives."

The modern reciprocating steam locomotive which Mr. Yellott referred to in his paper is the Pennsylvania T-1, a four cylinder single expansion, 6100 hp locomotive. In one road test this type engine hauled 16 cars over a 69 mile stretch of the Fort Wayne division at a 102 mph average.

A companion to the T-1 is the Q-2, a locomotive designed for freight service, but similar in many respects to the T-1. Pennsylvania now has 26 in service. Capable of pulling 125 loaded cars at more than 50 mph on sustained runs, these locomotives develop a drawing power of 114,860 lbs., or 78% more than that of the present standard coal-burning freight locomotive now in service on the Pennsylvania.

This company also has on order 25 new direct drive steam turbine locomotives, type S-2. The first of these has been built and is now approaching the end of a lengthy period of tests. Designed and constructed by the Baldwin Locomotive Works and the Westinghouse and Electric Manufacturing Company in collaboration with the Pennsylvania Railroad, it is the first of its type ever built in the United States. The steam turbine is designed to develop 6900 shaft horsepower and will pull a full-length passenger train at 100 mph and high class freight trains at high speeds.

Economics Studies on Coal-Burning Gas Turbine Locomotives Show Interesting Cost Comparisons

IN CONNECTION with its development of the new coal-burning gas turbine powered locomotive, comparative studies of fuel economics have been made by the Locomotive Development Committee.

Some of its figures would seem to indicate a possibility for conversion from Diesels to coal as a source of power. However, a thorough study of all cost factors is necessary, it is recognized, before railroad executives can make the ultimate decisions.

A fuel cost per mile for the Diesel of 30.4c was high compared to a cost of 9.8c per mile for coal-burning gas turbine and 26c for a fuel-oil burning gas turbine, it was brought out in a paper presented at the American Mining Congress at Cincinnati in April by John I. Yellott, Director of Research of the Locomotive Development Committee.

TABLE 1—Diesel-electric Switch Locomotive Cost Figures*

Summary of Average Operations of 14 Units Since Put in Service

Age, Years	2-5/6
Hours in period	24,114
Assigned, hours	22,241
In service, hours	20,396
Inspection, hours	318
Repairs, hours	1,528
Availability, per cent	92
Repairs, labor, $	3,588
Material, $	4,845
Total, $	8,433
Per hour, c	41.35
Fuel, gallon per hour	7.08
Cost per hour, c	40
Lubricant, pints per hour	0.91
Cost per hour, c	6.5
Supplies, cost per hour, c	1.25
Total cost per hour, c (repairs, fuel, lubricants, supplies)	89.1

* *Diesel Power and Diesel Transportation*, 23, No. 1, p. 65 (1945).

TABLE 2—1945 Average Locomotive Miles per Month in the U. S.

	Freight	Passenger
Steam	60 million (93.6%)	33.5 million (86.1%)
Diesel	3.04 million (4.7%)	3.3 million (8.5%)
Electric	1.08 million (1.7%)	2.1 million (2.1%)
Total	64.12 million	38.9 million

On the other hand, compared only on the basis of thermal efficiency, the Diesel leads the other types by a considerable margin:

Type	Efficiency
Diesel-electric	28%
Coal-burning gas turbine	18
Oil-burning gas turbine	19
Coal-burning steam	6 to 8

Actual time on the road—not in the shops for repairs and maintenance—is another point worth consideration. In a period of nearly three years the Central of Georgia Railway Co. found that its Diesel switchers were in service 20,396 hours out of an assigned 22,241 hours, or 92% of the time, as shown in Table 1. Recent operational reports of one railroad on reciprocating steam locomotives show an availability of 17½ hours out of 24, or about 73%.[1] This kind of information will not be available on the coal-burning gas turbine until actual operational tests have been completed.

The initial cost of a new Diesel is considerably higher, almost three times that of a modern reciprocating steam locomotive. On the basis of rail horsepower, the Diesel costs between $108 and $113 per hp., and the steamer about $42 per hp., according to Mr. Yellott.

Although the railroads are purchasing a predominance of Diesels as new equipment, approximately 90% of the total railroad miles traveled in the U. S. in 1945 were covered by steam powered trains, as shown in Table 2.

The comparative costs of the different fuels was advanced as another argument in favor of an increase in the use of coal. Quoting from Mr. Yellott's paper:

"The most effective means of comparing the value of various fuels is in terms of cost per million Btu. On this basis, coal was 13.1c per million Btu, fuel oil was 26c and Diesel fuel was 39c."

A complete study of the entire picture of all costs is needed before each type of power can be properly evaluated. Although Diesel fuel costs and initial purchase prices are shown to be higher than those of steam equipment, the fact remains that the Diesel has greater pulling power, better efficiency, and more available road time than its competitor.

References

(1) "A Look at Tomorrow's Power," J. E. Davenport, Vice-President, American Locomotive Co., *Railway Age*, 116, 9 (1944).

TOMORROW in Petroleum Technology

A Preview of Coming Technological and Economic Developments, Based on Study of Current News on Petroleum-Related Topics in Various Fields

Today's happenings in widely-divergent fields are destined to have vital significance in the future operations of the petroleum industry. Technical and economic topics projected this month for their possible later bearing on petroleum refining operations include:

Domestic use of "OXO" process revealed.

Synthine developments continue at rapid pace.

Tariff Commission issues report on petroleum.

Diesel industry anticipates continued growth.

Silica "soot" unlikely to replace carbon black.

Rubber situation remains basically cheerful.

Domestic Use of "OXO" Process Revealed

It is interesting to note that in at least one account of the recent technical conference held by scientists of the Standard Oil Co. (Ind.) was mentioned a discussion on "the adaptation to Standard's Whiting (Ind.) plant of the German 'OXO' technique for making higher-boiling alcohols used in many industrial processes[1]."

This process was discussed in some detail last fall in one of the first reports to be published on German refining activities[2]. It consists of (1) the treatment of olefins, such as those of the C_{11}-C_{18} range, with carbon monoxide and hydrogen over (in Germany, at least) cobalt-containing Synthine (Fischer-Tropsch) catalysts, preferably free of magnesium, at 275-302° F. under 150-200 atm. pressure, followed by (2) reduction of the aldehydes produced at 355° F. under 150 atm. pressure over either similar catalysts or such cheaper catalysts as those containing nickel.

In Germany, the olefins used were obtained by the catalytic dehydrogenation of Synthine paraffin wax, which presumably had a high content of straight-chain paraffins. It has been claimed, however, that olefins having from three to at least 20 carbon atoms can be converted into aldehydes in the first step of the process, and one report[2] even mentions the use of ethylene. In the production of long chain alcohols by the "OXO" process, those olefins with a double bond at the end of the paraffin chain are most desired.

Almost any source of olefins can be used, however, so that it is by no means certain that Indiana Standard, despite its known activities in the Synthine field, is planning to base its operations on Synthine-derived olefins. In fact, this company was the first in the field, over a decade ago, with a synthetic lubricating oil produced from olefins obtained by cracking petroleum-derived paraffin wax, so that it undoubtedly has a firm background for processes of this type.

Aldehydes, as mentioned, are produced by the first step of the process, but attempts to obtain 100% yields, based on the olefins, caused considerable conversion to alcohols in the first step. When aldehydes were desired, then, the Germans recommended production of the alcohols by the second step of the "OXO" process, then oxidation back to the aldehydes.

"OXO" alcohols were used in Germany primarily for the production of sulfonic ester surface-active agents—detergents and wetting agents—although some of the production was presumably diverted to the manufacture of plasticizers by formation of phthalic acid esters (of C_8-C_{11} alcohols). It is said that these alcohols are not very expensive to produce (possibly less than ten cents per pound), so that this first report of domestic production[1] is not at all unexpected. The "OXO" process is a natural corollary to the Synthine process, and it may well be that other companies will enter this field.

Synthine Developments Continue at Rapid Pace

In addition to the appearance of more information on the Hydrocol variation of the Synthine process, reported last month in NATIONAL PETROLEUM NEWS[3], the industry has continued to hear many reports of plans which involve use of the Synthine process.

For example, it is understood that the Stanolind Oil & Gas Co. is considering the erection of a Synthine plant in the Kansas part of the Hugoton natural gas field. This plant would use 100,000,000 cu. ft. of natural gas per day to produce 6000 b/d of gasoline and 1000 b/d of distillate fuels.

The exact location of the plant will not be determined until certain transportation studies are completed, and it appears that the shortage of construction materials may delay completion of the plant for as long as two years. No details are available on the Synthine variant to be used, although it is understood that Stanolind has conducted extensive experimentation (through the pilot plant stage) at its Tulsa laboratories.

Canadian developments are perhaps not so far advanced as in this country, but it is nevertheless interesting to note the report[4] that a "Calgary oil company is planning to erect a pilot plant for making gasoline from natural gas." This plant, which will cost about $100,000, is expected to be in operation this fall. It is claimed that the "process to be used is original with the developing company," and it is said that the plant will have a charging capacity of 2,000,000 cu. ft. daily of natural gas, yielding about five gallons of gasoline per 1000 cu. ft., (nearly 240 b/d). Based on the input of 100,000,000 cu. ft. of natural gas at the Kansas Synthine plant, this Canadian process would yield about 11,900 b/d or twice that of the Kansas process.

Domestic activities in Synthine research were recently highlighted at a two-day meeting of the Army-Navy Petroleum Board, at which the Navy, in conjunction with the petroleum industry, gave a demonstration of the use of variously-derived synthetic fuels and lubricants in amphibious craft, small boats, etc. The Texas Co., for example, provided a Synthine gaso-

(1) Anon., *Business Week*, No. 876, 59 (1946).

(2) Anon., NATIONAL PETROLEUM NEWS, *Technical Section*, 37, No. 45, R-926 (1945), "'OXO' Process Made Higher Alcohols from Fischer-Tropsch Olefins."

(3) Keith, P. C., NATIONAL PETROLEUM NEWS, *Technical Section*, 38, No. 27, R-506 (1946), "The New Hydrocol Process."

(4) Anon., NATIONAL PETROLEUM NEWS 38, No. 24, 50 (1946), "Plan Plant to Make Gasoline from Natural Gas in Canada."

line and Diesel oil, as did the Standard Oil Development Co. A foreign (French) produced Synthine Diesel fuel was also used in the demonstrations.

The Navy explained that its interest in these activities is concerned with the derivation of the data needed in the design of engines capable of obtaining the greatest efficiency from the use of synthetic fuels. In this connection, it is interesting to note that the recent appropriations bill for the Interior Department contained (as it left the Senate Appropriations Committee) $44,500 for a Diesel fuel research program on the chemical composition and properties of distillates in the Diesel fuel range, the committee having been told that the "armed services consider that quantities of this type of fuel of the magnitude of 750,000 b/d will be necessary in the future."

Few new details are available on the Bureau of Mines' program in this field, except for two reports stating (1) that plans to bring certain German Synthine units to this country for experimental purposes have become involved in reparation entanglements and (2) that the incorporation of the Missouri Ordnance Works into the Bureau's Synthine research program may be delayed for the duration of the world food emergency by a possible War Department decision to return this plant to the production of ammonia for fertilizer[5].

Synthine developments in regard to the use of natural gas came in for close attention at recent hearings of the Federal Power Commission. At one of these, P. C. Keith, president of Hydrocarbon Research, Inc., gave many of the details which are contained in his previously-mentioned paper on the Hydrocol process[3]. Keith contended that chemical and hydrocarbon-synthesis uses of natural gas would develop markets which would render uneconomic its waste.

In regard to eventual natural gas exhaustion, Keith pointed to some research conducted by his group which indicates that a city gas of 600-900 BTU can be made from coal by a variation of the Synthine process for 17-19 cents per 1000 cu. ft. and that such gas, made in West Virginia, could be delivered to New York city for 24.2 cents. Gas yields would apparently be about 20,000 cu. ft. per ton of coal, a thermal efficiency of about 80%[3]. Since coal deposits are scattered throughout the country and are of tremendous extent, it would appear that exhaustion of natural gas would not be as great a calamity as depicted in some circles. Keith estimated that known reserves now total 185 trillion cu. ft.

Coal and coke interests are not in agreement with these statements, incidentally. Without disputing the technology of Keith's process, Alfred R. Powell, research director of the Koppers Co., told the FPC that he doubted if it would ever become economic from a cost standpoint. The present argument before the FPC, of course, is concerned with the competition between coal and natural gas in areas in which coal interests have long been dominant and in which they do not care for competition.

Powell's statement, therefore, can be taken with a grain of salt; the coal industry (Koppers included) is busily engaged in research on and consideration of the synthesis of liquid fuels and high-BTU gases from coal by the Synthine process, as mentioned on numerous occasions in this series. Such synthesis may be several years or more off, however, unless petroleum prices advance considerably, so for the present the coal industry is primarily concerned with thermal instead of "chemical" uses.

The Synthine process continues to dominate the hydrocarbon synthesis field, with coal hydrogenation now fading into the more distant background. If and when petroleum supplies (domestic and import) run low, it can be expected to contribute its share of "petroleum" products, possibly in competition with shale oil. Meanwhile, it will certainly be used in competition with petroleum, with natural gas as the raw material, and the vast amount of present research, combined with information on German processes, will certainly contribute to swift technical advances.

Tariff Commission Issues Report on Petroleum

In response to requests from the Ways and Means Committee of the House of Representatives and the Finance Committee of the Senate, the U. S. Tariff Commission has been issuing a series of reports, the "War Changes in Industry Series," on those principal domestic industries whose operations have been variously affected by the war. The latest in this series is a report on "Petroleum"[6] which, while it contains little that is unknown to the industry, is still of some interest as a fairly noncontroversial review of the field.

Moreover, the report does summarize some important information on the effect of U. S. tariffs on imports of petroleum and some interesting facts and statistics on the status of the industry in more than 30 foreign countries, including mention of American activities.

Statistics are often much maligned because they can be so easily misused. This is particularly true in the petroleum field where the same data, for example, is interpreted by one group to indicate "plenty of petroleum" and by another to foretell a coming shortage. This Tariff Commission report steers a fairly straight path between the contesting groups on pipelines, surplus tankers, and the petroleum reserves situation, and it is to be hoped that the congressional committes for whom it was prepared will be at least as objective in its use.

Diesel Industry Anticipates Continued Growth

According to some recent statistics in *Business Week*[7], attributed to R. F. Friend, president of the Nordberg Mfg. Co., the Navy during the war installed over 30,000,000 h.p. of Diesel engines, ranging in size from 60 to 6000 h.p., and from 1939-1945 over 1,000,000 h.p. was installed on merchant ships.

Phenomenal as was this expansion (over $1,000,000,000 worth of engines produced in 1944, compared with $45,000,000 in 1939), the Diesel industry is not depressed by the lessened military demands but is instead confidently planning to expand the use of Diesels in many fields.

Space here does not permit discussion of recent technical advances, but these have been significant in scope. A. W. McKinney of the National Supply Co. "foresees a trend toward Diesels because natural gas has become more valuable for other uses, although comparatively Diesel fuel is no cheaper." The Diesel industry hopes to supplant gas engines and steam boilers as a source of power in petroleum drilling operations, especially in rotary drilling where only a few of the rigs are of this type.

V. C. Glenn of General Motors believes that the 1½-5 ton truck field will provide a good market for Diesel engines, although he states that such engines will have to sell for $5 per h.p. to compete in the 1½ ton and under field (80-90% of the market); "they now cost about $15 per h.p. in that class." Glenn believes that the truck field offers an annual market for 20,000-25,000 Diesels.

Excluding armed service installations, the use of the 5,000,000-6,000,000 h.p. of Diesels at present installed in stationary plants is said by R. H. Morse, Jr., vice-president of Fairbanks, Morse & Co., to be divided somewhat as follows: (1) municipal power

(5) Anon., NATIONAL PETROLEUM NEWS, 38, No. 24, 8 (1946).

(6) Anon., *Petroleum*, U. S. Tariff Commission, War Changes in Industry Series, Report No. 17, Superintendent of Documents, Washington, 1946. 30 cents.

(7) Anon., *Business Week*, No. 877, 52 (1946), "Diesel Industry Hits Stride."

plants, 27%; (2) private utilities and Rural Electrification Administration cooperatives, 14%; (3) the petroleum industry, 12%; (4) cotton and related industries, 8%; (5) the grain industry, 6%; (6) the ice and refrigeration industry, about 5%; and (7) miscellaneous industries—mining, rock and clay products, textile, lumber and woodworking, irrigation, metal working, etc., about 28%.

Railroad uses are also expected to increase; it is enlightening to note that the railroads, while supporting the coal interests in their pleas before the FPC for protection against natural gas, have on order—as J. H. Parmalee of the American Association of Railroads had to admit—516 Diesel locomotives out of a total of 585 locomotives of all types. (Further information on railroads' use of Diesels is contained in an article in this issue, pg. R-562.)

The petroleum industry was hard put, during the recent war, to supply all the demands for quality Diesel fuels and similar-boiling-range catalytic cracking feed stocks. Present Navy Diesel fuel demands are considerably lower, it is true—120,000 b/d and 50,000 b/d for Navy Special and Diesel fuel oils, respectively, against 457,000 b/d and 164,000 b/d for this time last year, and they are likely to go even lower, to 100,000 b/d and 30,000 b/d, respectively, for the rest of the 1946-47 fiscal year[8]. Nevertheless, as previously mentioned in this article, the armed services believe that they may require, in the future, some 750,000 b/d of fuels of the Diesel fuel boiling range to meet their needs for "gas-turbo (jet propulsion) fuels."

William H. Hubner and Gustav Egloff[9] stated, ten years ago, that no shortage of Diesel fuels could be foreseen. Whether this forecast will hold indefinitely is not so clear, but it is certain that the petroleum industry faces a good demand for the Diesel fuels which it will produce.

Silica "Soot" Unlikely To Replace Carbon Black

Carbon black has long been a most important chemical derivative of natural gas, even though certain interests have fought the use of the latter for its production, terming the low yields obtained "intolerably wasteful." Recent "furnace" processes have greatly increased these yields, however, although the furnace blacks by no means replace the channel blacks in all of their uses. In addition, at least one manufacturer (Phillips) is now producing carbon blacks from "degraded oils," but it remains axiomatic that the rubber industry must depend for its carbon blacks upon those produced from natural gas, since at least some of these blacks possess properties not available in those produced (at higher costs) from acetylene and other sources.

The actual function of carbon black as a rubber reinforcer is by no means easy to explain, but it is apparently related to the size (and uniformity) of the particles involved. It is at least academically interesting to learn, therefore, that a new silica "soot," of white, translucent color, possesses similar properties and (under the electron microscope) has been shown to have particles of the same size and shape as carbon black.

In this country, the B. F. Goodrich Co. has recently announced (and received a patent for) a process for the production of a powdery "fumed silica" produced by combustion of ethyl silicate. Since this fumed silica yields rubber compounds of similar properties to those produced by the addition of carbon black to rubber, yet without the discoloration involved in the use of the latter, it presents interesting potentialities for the production of rubber articles of any desired color.

It is not at all clear whether the heralded use of this fumed silica in tires—other than ornamental sidewalls—is particularly desirable, considering driving conditions. Potentialities for such uses as rubber overshoes, floor coverings, electric appliance cord coverings, etc., are more attractive, however.

Until recently, at least, Goodrich had only engaged in pilot plant production of this "white soot" and had not decided where to erect a commercial plant. The fumed silica is said to have a high cost as compared with carbon black, so that Goodrich may be waiting to gauge market potentialities before proceeding further.

It may be doubted, however, that any of these fumed silicas will seriously affect the market for carbon black unless the price of the latter increases markedly. Some price increase is inevitable, of course, for the carbon black industry has always depended upon very low-cost natural gas, which is rapidly disappearing, but there is probably a *considerable* gap in cost between the two rubber compounding agents.

Fumed silicas may very well take over certain rubber specialty fields, where the cost of materials is of less importance than the color, but it will probably be a long time—if ever—before they invade the major carbon black field—rubber tires. Not everyone wants white sidewalls at a premium price.

Rubber Situation Basically Cheerful

In these days of shortages, strikes, and delays of many types, it is a comforting thought to realize that the war-built synthetic rubber industry is serving this country as well in peace as it did valiantly in war. Even here certain component parts — textiles, bead wire, rosin, and casein—are in short supply, but few industries can offer news to support such a headline as '46 *Passenger Car Tire Quota Raised*[10].

Of course, "the British-dominated rubber cartel is showing signs of repeating the pattern of the last postwar period and charging for natural rubber all that the traffic will bear."[11] Much pressure was brought to bear to raise the price from its recent 20.25 cents (F.O.B. Far Eastern ports) to 35 cents per pound, with the threat that the U. S., which at present is allotted 50% of the natural rubber crop, would be cut off if this price were not paid. U. S. authorities were able, however, to hold the price to 23.5 cents, a satisfactory figure since rubber, "short all over the world, is fetching 31 cents in South American markets."

As mentioned in last month's article[12], the U. S. has put back into limited butadiene production its alcohol-butadiene plant at Institute, W. Va., to supplement capacity production of petroleum butadiene, but the present consumption pattern calls for 190,000 tons of natural rubber this year, and the present balanced position would have been badly disrupted without this supply, especially since the alcohol shortage will not permit continued operation of even the institute plant.

To counter this threat, the U. S. pointed to the definite fact that a rubber "strike" might deal a death-blow to natural rubber's chances of ever regaining dominance in the domestic market. Rubber manufacturers are working wonders with the present synthetic rubbers and are developing new and better elastomers. Synthetic rubber prices (for GR-S, at least) seem certain to settle to a level of not over 15-16 cents per pound, and Butyl, Buna-N types, and Neoprene have all won large markets for themselves, regardless of price.

Since the British interests were not foolishly short-sighted, then, it seems unlikely that any rubber shortage will affect present plans to produce 69,150,000 passenger car tires this year.

(8) Anon., NATIONAL PETROLEUM NEWS 38, No. 28, 5 (1946), "Ahead of the News—Navy Leveling Off."

(9) Hubner, W. H. and Egloff, Gustav, NATIONAL PETROLEUM NEWS 28, No. 25 (1936), "Ample Future Supply of Diesel Fuel Obtainable from Various Sources."

(10) Anon., NATIONAL PETROLEUM NEWS 38, No. 22, 6 (1946).

(11) Anon., *Business Week*, No. 874, 7 (1946), "Rubber Gouge Resisted"; No. 878, 20 (1946), "Rubber at 23.5c."

(12) Anon., NATIONAL PETROLEUM NEWS *Technical Section*, 38, No. 27, R-489 (1946), "Alcohol from Petroleum Faces Future Problems."

18,000 b/d Refinery Spends $750,000 To Remodel Facilities, Improve Products

Independent Refiner Adds New Equipment, Revamps Existing Units to Increase Operating Efficiency and Product Quality; Plant Capacity Unchanged

COSDEN Petroleum Corp. has completed a $750,000 plant modernization program at its Big Spring, Texas, refinery to improve product quality and reduce treating costs and general overhead. Nominal throughput of 18,000 b/d remains unchanged.

The program started with the obvious fact that the heaters for the two old Foster topping units were in bad shape, having been in service since the plant was built. A survey revealed it would be more economic to scrap them than to attempt rebuilding; coupled with this was the recognized need of fractionating equipment adequate for the separations required.

It was decided to consolidate the two toppers into one, revamping the fractionating equipment at the same time. To further improve straight-run product quality a new heater was installed at the vapor-phase desulfurization unit. A still further improvement in product quality and lessened treating cost, developed from the plant revamp survey, was the elimination of Doctor sweetening in favor of Unisol mercaptan extraction for desulfurizing cracked gasoline.

Earlier changes were made in refinery utilities, some of which had been proving a bottleneck to design capacity during the war. The water-supply was converted from wells on the property to the use of sewage-disposal plant effluent from the nearby city of Big Spring, boiler-water softening facilities were added to reduce chemical treating costs, and cooling water facilities were reconditioned to better utilize available equipment. Still earlier, steam generators were installed on the two Dubbs crackers to reduce load on plant boilers and improve these units' heat balance. All design changes were engineered by Universal Oil Products Co.

Several Processes Available

Of particular interest in the plant as it now stands is the variety of treating processes used or available. High and low-temperature Gray clay treating (straight-run and cracked gasolines, respectively), Girbotol hydrogen sulfide removal, Unisol treating for mercaptan extraction from cracked gasoline, and batch treating for burning oils. The plant originally consisted of two small Foster topping units, two Dubbs cracking units, Gray clay process towers and Doctor sweetening. This refinery does not produce lubricating oils, but purchases outside stocks for blending to specifications, hence its products are 91 octane aviation gasoline, 80 octane premium, 73 octane housebrand and third-grade gasoline, tractor and Diesel fuels, and Nos. 1, 2, 3 and residual fuels. It is anticipated that a market also may be found for mercaptans from Unisol treating.

Crude Unit Revamped

An idle tower was salvaged for use as No. 1 crude tower, the old No. 2 Foster tower serving as the No. 2 crude tower. New or additional trays were installed in each. (The old No. 1 Foster tower was installed as a rerun tower in the enlarged hot-clay desulfurization unit.)

The new crude heater is a late design Dubbs updraft side-fired type which functions both as a reboiler for No. 1 tower and a crude heater coil for No. 2 tower.

Crude flow into the unit is shown in Fig. 1.

Mixed crudes from East Howard, Howard Glasscock and Wasson fields are mixed in a header from which the crude pump takes suction. Control of mix is by manual adjustment of field tank valves based on tape gaugings, although orifice flanges are available for instrument control should it prove desirable. Relative proportions change from day to day and largely are dictated by availability of the various crudes. Lime is

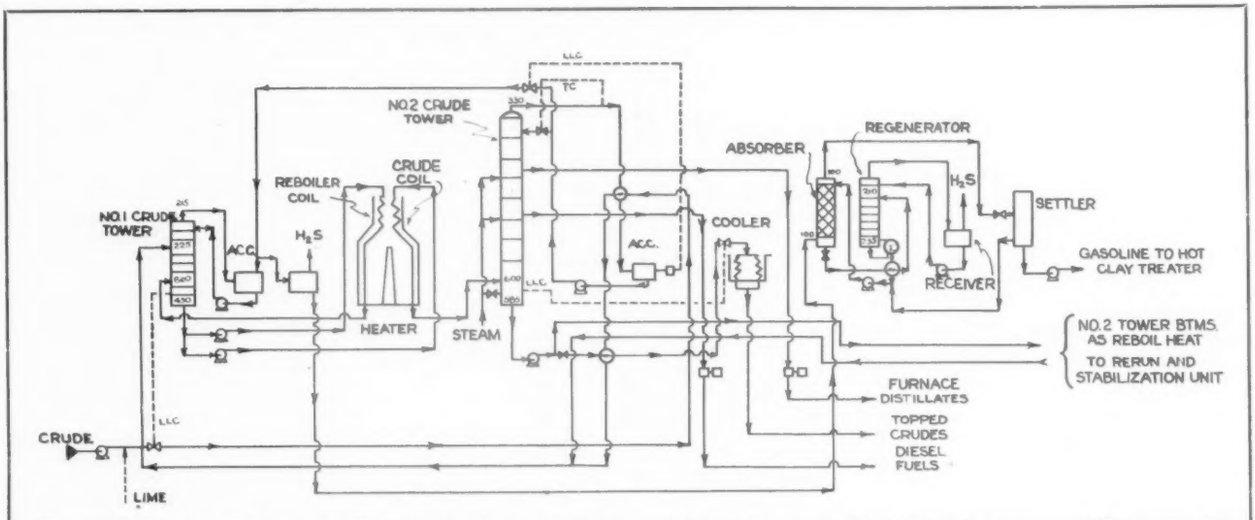


Fig. 1—Flow sheet for revamped crude topping unit (left) and Girbotol treater (right) for hydrogen sulfide removal from straight-run gasoline

added to the cold crude at this point for corrosion control.

Preheat is attained by successive exchange with overhead vapors and bottoms from No. 2 crude tower, whence crude is flashed in No. 1 tower, bottoms of which are split into two streams. The first stream is the reboiler cycle to No. 1 tower, the second being charged through the preheater coil into the side of No. 2 tower. Gasoline overhead from No. 1 tower is a 320 to 325 end-point naphtha while that from No. 2 is 410-420 end-point. Both streams normally combine in a common surge tank from which the Girbotol feed pump takes suction.

No. 2 tower is equipped for two side draw-offs, furnace distillate and Diesel fuel. Bottoms from No. 2 tower splits into three streams: the first supplies reboiler heat for the new stabilizer tower, returning to mix with bottoms pump effluent; the second constitutes additional feed to No. 1 crude tower which acts as additional reflux, and the third is cooled and dropped out to topped crude storage for cracking.

Revamp Improves Quality

Table 1, which shows company specifications for Diesel and tractor fuels and three furnace distillates, indicates the major advantages attained by the topping plant revamp so far as product quality is concerned. Gasoline is not included because its quality was for most part unaffected by the change and is considered in more detail elsewhere in this article.

Improvement is most apparent in front-end boiling ranges for products after the revamp. Much of this lower boiling material, not present in the after-revamp product, now is available for inclusion in the more valuable products, naphtha and gasoline. Color improvement in No. 2 fuel of ½ NPA also is noticeable. Since these are specification maxima rather than individual product tests, the improvements shown are not as apparent as they otherwise would be.

Girbotol and Hot-Clay Treating

Charge to the Girbotol unit, also shown in Fig. 1, is a mixture of light and 410-420 E. P. straight-run gasolines at 100° F., which contain the hydrogen sulfide originally present in the crude as well as that produced during topping. The scrubbing medium is diethanolamine, which absorbs H_2S in countercurrent flow. Gasoline overhead from the Girbotol flows through a settler and thence to blending or storage tanks or to the hot clay (Gray process) desulfurization unit. Fat diethanolamine, absorber bottoms, is heated to 210° F. by exchange with regenerator bottoms and thence charged to the top of the regenerator. Lean bottoms are returned to process with a sidestream cycled through a bottoms-to-steam exchanger for reboil heat. Hydrogen sulfide, 95% pure off the settler, is vented to a flare; volume amounts to about 4.5 tons daily, based on 15,000 b/d crude rate.

Girbotol treated gasoline contains a residual amount of hydrogen sulfide—about 2% of the amount in charge—and approximately 0.20% total sulfur. Effluent from this unit (on-stream sample) is shown in Table 2 as charge to the hot clay desulfurization unit.

The hot clay process is used only for

TABLE 1—Fuel Specifications Before and After Topping Plant Revamp

	Tractor Fuel	Cosden Diesel	Heavy Diesel	No. 1 Fuel	No. 2 Fuel	No. 3 Fuel
Before Revamping Plant:						
Gravity	38-40	34-37	33-35	38-40	35-37	33-35
Pour °F.	—15	0	+15	—15	—	[illegible]
Color, NPA	1	2½	4	1½	3	4
Vis., SU @ 100	30-35	35-45	35-45	35	35-40	35-45
Sulphur, %	0.5	0.8	0.75	0.5	0.7	0.[illegible]
Carbon, Max. (10% bottoms)	0.12	0.20	0.20	0.12	0.25	0.25
Corrosion	OK	OK	OK	OK	OK	OK
Flash, C.C. Min.	130	150	150	130	130	125
Cetane	30-35 Oct. A.S.T.M.	48-50	48-50	45+	45+	45+
Diesel Index	....	52	53	52	52	52
I.B.P.	320-340	320-340	340-350	320-340	310-320	310-330
10%	370-390	420-440	430-440	380-400	400-420	425-450
50%	420-440	490-500	520-540	440-450	440-450	450-470
90%	470-480	625-650	640-670	490-510	590-600	650-675
E.P., Max.	495-520	700	700	540-560	630-650	700
After Revamping Plant:						
Gravity	38-40	34-37	33-35	38-40	35-37	33-35
Pour °F.	—15	0-10	+15	0	0	+10
Color, NPA	1	2½	4	1½	2½	4
Vis., SU @ 100	30-35	35-45	35-45	35	35-40	35-45
Sulphur, % Max.	0.5	0.75	0.75	0.5	0.7	0.75
Carbon, Max. (10% Bottoms)	0.12	0.20	0.20	0.12	0.20	0.20
Corrosion	OK	OK	OK	OK	OK	OK
Flash, C.C. Min.	130	150	150	130	130	125
Cetane	30-35 Oct. A.S.T.M.	48-50	48-50	45+	45+	45+
Diesel Index	50	52	53	52	52	52
I.B.P.	340-360	380-400	390-410	340-360	370-390	390-410
10%	380-400	440-460	450-470	380-400	420-440	450-470
50%	420-440	500-520	540-560	440-450	490-510	540-560
90%	470-480	625-650	650-675	490-510	590-600	650-675
E.P., Max.	490-510	700	725	540-560	630-650	725

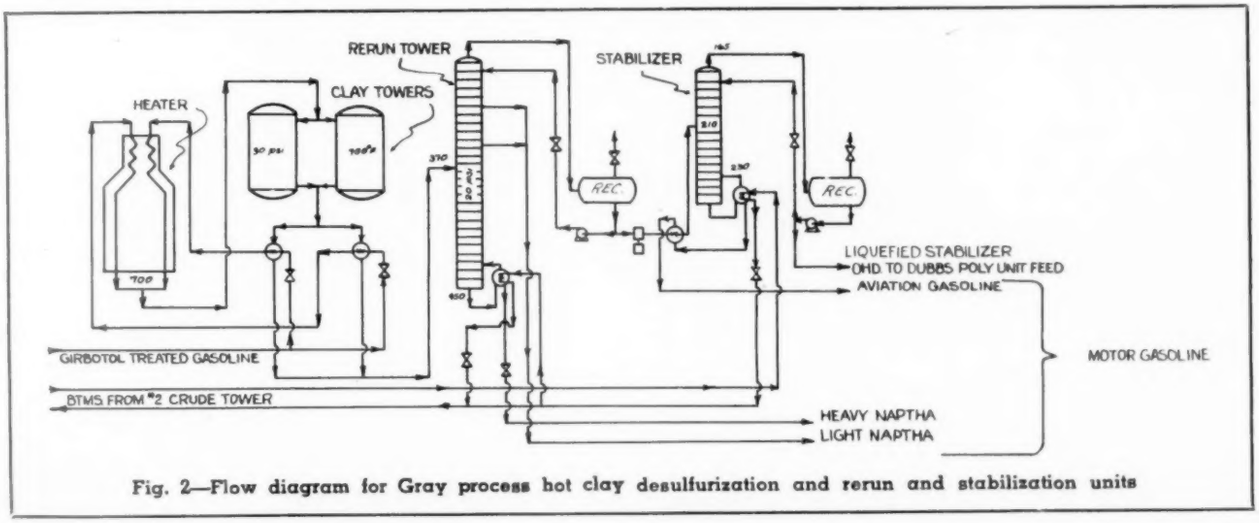
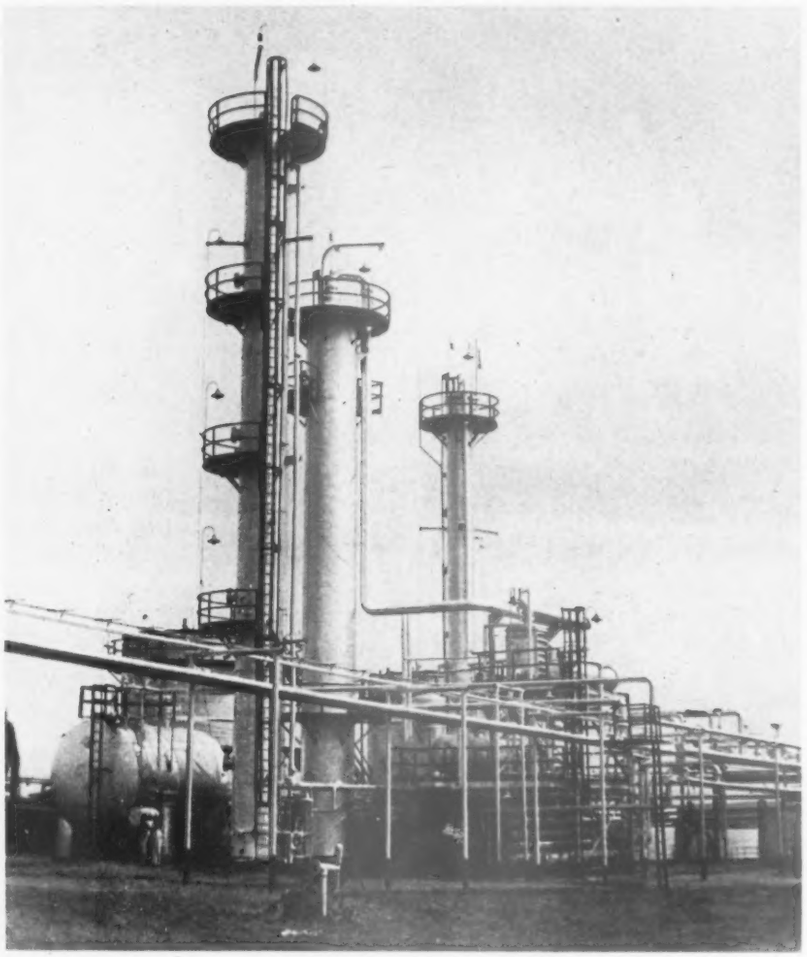


Fig. 2—Flow diagram for Gray process hot clay desulfurization and rerun and stabilization units



Unisol unit for extracting mercaptans from cracked gasoline with caustic-methanol. Left to right are shown treated gasoline surge drum, extraction column, caustic stripper and aqueous methanol stripper (behind heat-exchanger equipment)

treating straight-run gasoline. While it also will work on cracked gasoline, there is considerable loss to polymerization of the unsaturated hydrocarbon content and, moreover, these polymers cause a rapid drop in desulfurizing efficiency of the clay and extremely short clay life. Straight-run gasoline, since it is lacking in unsaturates, forms no polymer in this process. No attempt is made to regenerate the clay.

Flow to Clay Treaters Is Split

Girbotol gasoline stream to the hot-clay desulfurizer (Fig. 2) is split, each picking up heat by exchange with treated gasoline effluent from the clay towers in separate exchangers and thence to one or the other of the two coils of the clay unit heater. Both streams merge and are charged to the two clay towers at 700° F. again in split stream. Emerging they are charged to the rerun tower.

Table 2 shows Girbotol treated charge to and stabilized product after vapor-phase desulfurization. These data are from single on-stream samples and are not necessarily representative since the efficiency obviously varies with the age of the clay, type of charging stock and operating conditions.

Function of the desulferizer rerun tower is to make low end-point top products, suitable for use in premium and aviation gasolines, and naphtha bottoms which are sometimes recombined with the tops. It also is equipped to take off to side-streams for specialty-naphtha cuts if desired, and these are shown on Fig. 2 as "light naphtha."

The rerun tower charges gasoline at 370° F. and 20 psi. direct from the hot-clay treater, overhead temperature being 250° F. and bottoms leaving at 450° F. Reboil heat for both this and the stabilizer column are supplied by topped crude as bottoms from No. 2 crude tower (shown in Fig. 1). Rerun tower bottoms, as previously stated, is the "heavy naphtha" shown in Fig. 2, and pumped directly to storage.

Condensed rerun tower overhead is charged at 210° F. to the stabilizer. Tops from this tower are maintained at 165° F., bottoms 290° F. The stabilizer removes a considerable quantity of hydrogen sulfide, gases from its reflux accumulator being utilized as plant fuel. Doctor-sweet stabilizer bottoms likewise are charged to straight-run storage although shown separately in Fig. 2 as "light naphtha." This line passes through an old caustic scrubber before joining the heavy naphtha line, scrubbing being purely precautionary should the stabilizer "get in trouble." Condensed overhead is charged to the polymerization plant as a means of recovering straight-run butane for gasoline volatility.

The straight-run gasoline of 400 E. P., as run to storage, contains cyclic sulfur compounds in varying proportions depending upon the age of the clay. When blended with cracked gasoline from the Unisol treater next described and natural gasoline, the sulfur content ranges from 0.10% to 0.20% total sulfur. A current finished gasoline blend has a clear ASTM motor octane rating of 64 to 65 which required 1.2-1.4 cc. tetraethyl lead to bring it to 74 octane housebrand quality and 2.0-2.3 cc. to make 78 octane premium fuel.

Unisol Treating

No major process changes were made in the existing Dubbs cracking system, which consists of two units rated at 6000 and 5000 b/d respectively. However, shortly before the present revamping program was begun, both units were equipped with steam generators, using heat from residuum bottoms, to augment plant steam capacity.

Until the past few days neither of the two units have been running in recent weeks, because considerable cracked material had accumulated earlier in the year and an excellent market as fuel oil exists for the topped crude.

Operating data and experience on the Unisol unit thus is available only from January to March, a long enough period to get the bugs out of it but insufficient to enable operators to attain design figures on chemical consumption. Briefly, the unit makes use of the increased solv-

TABLE 2

Characteristics of Product from Girbotol Treating and Vapor-Phase Desulfurization (Gray Process) Units

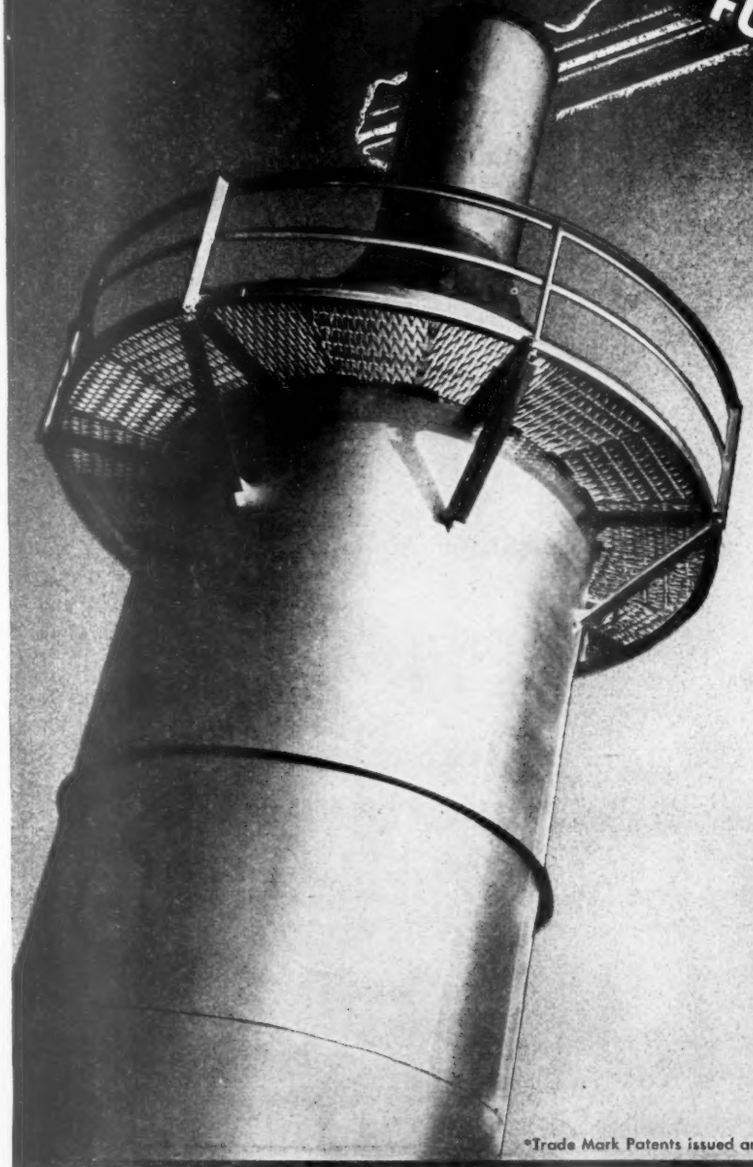
	Charge To Clay Treater*	Stabilized Clay Treater Effluent**
Gravity	55.0	54.5
Color	30	29
IBP	108	126
10%	186	190
20%	212	214
50%	262	260
90%	346	340
EP	386	384
Rec., %	98	98
Vap. pressure, Reid	5.4	2.8
Sulfur, %	0.21	0.08
ON ASTM	62.2	62.3
+1.5 ccTEL	69.8	73.7
+3.0 ccTEL	73.9	78.0

* Effluent from Girbotol Unit (hydrogen sulfide removal).

** Product stabilized to remove residual H_2S formed during hot clay treating.

PETRO-CHEM ISO-FLOW* FURNACES

...THE KEY TO FURNACE EFFICIENCY



Economy of Fuel

for any given exit flue gas temperature, Iso-Flow* Furnaces have a higher efficiency due to lower radiation loss, low excess air and absence of air infiltration.

Economy of Materials

Petro-Chem Iso-Flow Furnaces require less than two-thirds of the materials used in conventional box type furnaces.

Economy of Space

Petro-Chem Iso-Flow Furnaces require less than one half the space necessary for conventional box type furnaces.

Economy of Maintenance

due to even heat distribution, no exposed refractories, fewer headers, less cleaning time.

... and Petro-Chem Iso-Flow Furnaces are unlimited in Size ... Capacity ... Duty ... more than 300 are now in operation.

*Trade Mark Patents issued and pending

PETRO-CHEM DEVELOPMENT CO., INC.

120 EAST 41st STREET, NEW YORK 17, N. Y.

REPRESENTATIVES

Bethlehem Supply Co., Tulsa, Houston • Petroleum Equipment Co., Los Angeles • D. D. Foster Co., Pittsburgh • Faville-Levally Corp., Chicago

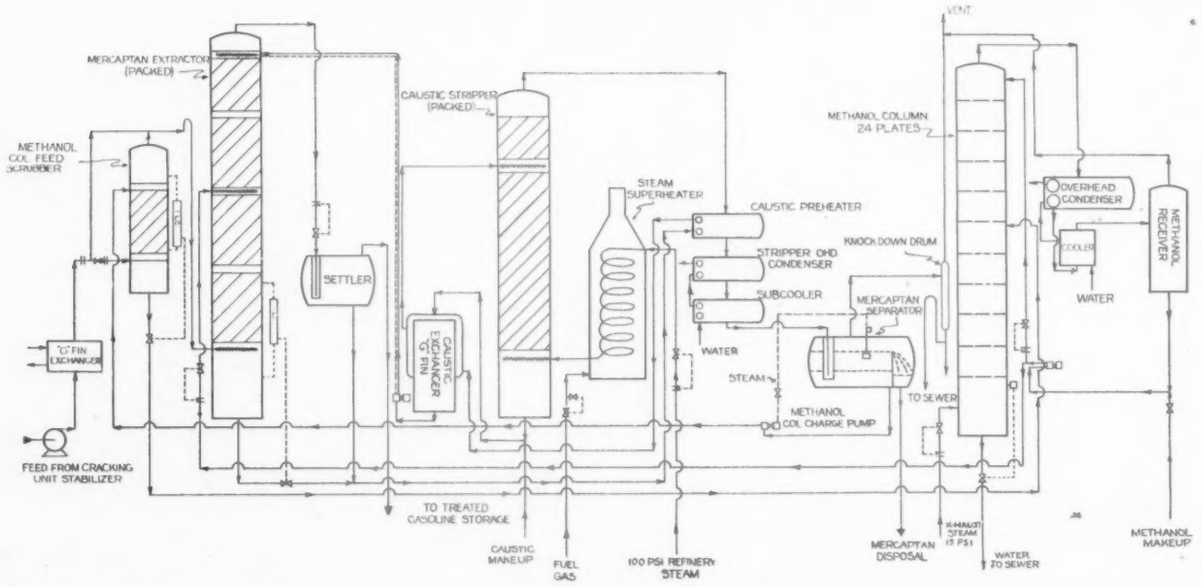


Fig. 3—Processing sequence for removing mercaptans by the Unisol (caustic methanol) method at Cosden refinery

Equipment Specifications

Crude Distillation Unit

Crude Heater	Side fired updraft type 20 ft. 3 in. high by 16 ft. 4 in. wide by 51 ft. 7 in. long. 96 tubes 5 in. by 50 ft. schedule 40 carbon steel, 44 radiant, 52 convection.
No. 1 Crude Tower	12 ft. 6 in. by 46 ft., 12 bubble trays.
No. 2 Crude Tower	9 ft. by 67 ft. 10 in., 28 bubble trays.
No. 1 Distillate Receiver	12 ft. by 17 ft.
No. 2 Distillate Receiver	5 ft. by 10 ft.

Girbotol Unit

Absorber	43 ft. by 6 ft. 34 ft. packed with 1½ in. carbon Raschig rings.
Regenerator (2)	11 ft. by 31 ft. 9 in., 17 side-to-side pans.
Reactivator Receiver	1 ft. 6 in. by 5 ft.
Hydrocarbon Settler	4 ft. by 12 ft.

Hot Clay Desulfurization Unit

Heater	Side fired updraft type 19 ft. 1⅜ in. long, 12 ft. 8½ in. wide, 24 ft. high. Contains 80 4-in. tubes 20 ft. long schedule 40 steel, 44 tubes in radiant section, 37 convection.
Clay Tower (2)	Towers 12 ft. by 17 ft. packed with a Texas clay 14-20 mesh.

Rerun and Stabilization Unit

Rerun Tower	9 ft. by 67 ft. 10 in., 26 side-to-side pans.
Stabilizer	3 ft. by 52 ft., 30 bubble trays.
Reflux Receiver	5 ft. by 19 ft. 8¾ in.
Stabilizer Receiver	3 ft. by 10 ft.

Unisol Unit

Steam Superheater	Spiral coil type, 433 sq. in. heating surface.
Methanol Column Feed Scrubber	18 ft. O.D. by 12 ft. high, packed with carbon Raschig rings.
Mercaptan Extractor	4 ft. 6 in. by 73 ft., 7/8 in. shell, contains beds of carbon Raschig rings. Beds separated by 3 steel distribution plates.
Caustic Stripper	5 ft. by 50 ft., ⅜ in. shell, Monel-lined 15 ft. bottom section, contains beds of carbon Raschig rings separated by steel distributor plate.
Methanol Column	3 ft. by 54 ft., ⅜ in. shell, has 24 cast iron bubble trays.
Mercaptan Separator	3 ft. 6 in. by 12 ft., 5/8 in. shell.

ent power of caustic solution in the presence of methyl alcohol for mercaptans and the major part of the equipment is required to regenerate the extracting solution.

A schematic flowsheet of the Unisol plant is shown in Fig. 3. Cracked gasoline stream from cracking unit stabilizers is heated by exhaust steam during cold weather to 100° F. and split, one portion entering the bottom of the extraction tower while the other enters a feed scrubber, which may be by-passed at will, before combining with the other stream at 100-105° F. to the extractor. Flow is countercurrent in the extractor, 44° Be caustic entering at the top, methanol on the side, and both being drawn off the bottom. Extractor overhead, gasoline 98-99% free of mercaptan, is settled and sent to storage.

Extractor Bottoms Preheated

Caustic-methanol extractor bottoms attain preheat in exchange with caustic scrubber overhead and then stripped caustic before entering the stripper where methanol-mercaptans-water mixture is taken overhead, stripping being accomplished by 800° F. superheated steam obtained from a gas-fired coil-superheater supplied with 100 psi. plant steam.

The fat methanol-water mixture is taken to a horizontal separator controlled by a phase level controller, where mercaptans spill over a baffle for withdrawal to disposal and lean methanol-water is discharged to the methanol feed scrubber before returning to enter the side of the 24-plate methanol column. Here 95% methanol concentrate is taken overhead and water, bottoms, drops out to the sewer. Heat for this column is supplied by 15 psi. exhaust steam from refinery mains.

Table 3 shows typical Unisol operating

PROPYLENES

can be converted

Profitably!

Profitable conversion of propylenes to produce high octane gasoline at low cost, is a point that no refiner should overlook.

Typical study reveals the following interesting facts concerning yield and operating costs:

Producing 16.5 gallons of 10# R.V.P. of 82 octane number polymer per 1,000 cubic feet of propylene at an operating cost of 2-2.5¢ per gallon.

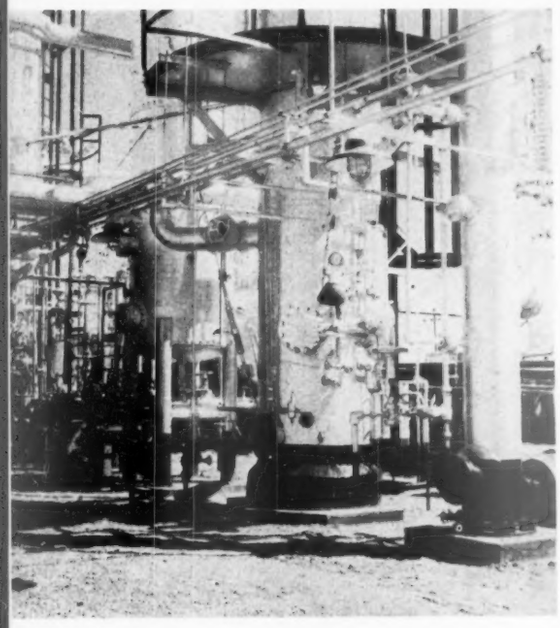
Polymerization is a proven process. More than 95 UOP Poly units are "on stream" and efficiently producing for refiners in the United States and foreign countries. We shall be glad to give you further details, and to discuss the profit possibilities of this process as applied to your individual operation.

UNIVERSAL OIL PRODUCTS COMPANY

General Offices: 310 S. MICHIGAN AVE. UOP CHICAGO 4, ILLINOIS, U. S. A.

LABORATORIES: RIVERSIDE, ILLINOIS

UNIVERSAL SERVICE PROTECTS YOUR REFINERY



Maze of control equipment and piping at Unisol unit. Columns left to right are caustic stripper, methanol receiver, methanol column and methanol feed scrubber

data, selected at random from the plant log book, for rates of feed ranging from 1500 to 5700 b/d. Caustic requirements approximate 0.08 lbs. per bbl. of feed, while methanol consumption runs somewhat above design estimate of 4 gal. per 1000 bbls. of feed. Mercaptan extraction is better than 98% on the average. Steam requirement averages 19.4 lbs. per bbl. feed of superheated steam (for caustic stripper) and 13.7 lbs. per bbl. feed of plant steam (for methanol column).

Plant Utilities

Little attention apparently was paid to water supply when the Cosden plant was built. For one thing, the water was almost saturated with calcium ion, which promptly fouled the cooling system to the despair of water treating engineers. Secondly, it was usual for the plant to go on short rations in summer as the wells died down, and generally necessary to drill from one to two new ones annually to augment supply. When Big Spring (a few miles west) installed sewage disposal facilities last summer Cosden officials decided to use part of the effluent, since this had already been shown to be satisfactory by industrial experience elsewhere and the supply would be more dependable.

At the same time it was decided to improve boiler feedwater by installing an "Infilco" softener of 165 gpm capacity, guaranteed to furnish 25 ppm maximum hardness (as $CaSO_4$) from the incoming 225 ppm water. This unit injects a solution containing disodium phosphate, caustic soda and "K-gel" (trade name for a sea-weed extract) into the feedwater to maintain phosphate at 30-60 ppm and total alkalinity at 200-400 ppm. (To control alkalinity it is sometimes necessary to add gypsum.) Total dissolved solids in boiler water is maintained at 12,000 ppm maximum by continuous blowdown.

Operating Costs Lowered

All told, the water softener has permitted direct savings of $26,000 annually from reduced consumption of water softening chemicals and the various maintenance costs on equipment served by the softened water mentioned above. Fuel savings at boilers are estimated at $30,000 while electric power savings, resulting from decreased use of electrically-driven stand-bys on the circulating water system, will exceed either of these two figures, engineers believe.

At present there are three boilers and two steam generators in the plant for a total of 48,250 lbs. per hour from the boilers and 30,900 lbs. per hour from the Dubbs generators, 79,150 lbs per hour overall. Normal steam load is considered to be 65,000 lbs. per hour.

In addition to supplying boiler feedwater, the softener supplies coolant for the compressor and jackets of four engines at the Dubbs units and to the driving engines of the two cooling-water system pumps. Hot oil pump bearings at the crude unit also are cooled by softened water. Formerly all these were supplied boiler blow-down water, which was of zero hardness but high in total solids. This promptly scaled the engines, forced them below rated speed, and consequently reduced coolant water circulation. This, plus the scaling tendency of the extremely hard cooling water, forced curtailment of cracking operations all too frequently—to descale the engine jackets, the cooling towers or condensers.

The plant has two cooling-water systems, if the coolant for engine-driven compressors and pumps is excepted: a relatively new "Marley system" and an old natural draft tower, now shut down. The Marley system has an 8000 gpm induced draft tower, an oil separator box and a pond.

The original system permitted oily water from the units to be pumped directly over the cooling towers before discharging to the pond. Two years ago the pond and tower were cleaned of oil and sludge and the flow reversed so that water now flows through the separator box into the pond, thence to the tower and units. Second bottle-neck was insufficient line capacity to return cold water to units, which originally consisted of two 12-in. lines and now has been augmented by a third 12-in. line. Third bottle-neck was that the tower was operated for more than a year on the original hard water supply, hence again became scale-fouled. Another reconditioning and rearrangement of water distribution nozzles has regained nearly 100% of original design efficiency.

The changeover to the new water supply, new softener and reconditioning of the Marley system, plus the steam-generating capacity at the Dubbs units, is accepted by plant officials as practically solving utility problems. There still remains some question that the Marley will handle all cooling requirements in summer but, if proved inadequate, probably will be solved by addition of another cell to the Marley tower.

TABLE 3—Unisol Process Operating Data

Feed, BPD*	1440	2880	3510	4080	4555	5740
Extractor:						
Temp. of Extractor, °F.	100	100	103	102	100	107
Caustic rate, BPD	150	150	206	200	202	204
Caustic Gravity, °Be	44.5	44.5	44	47.5	46.3	43
Methanol Rate, BPD	30.8	30.8	41	41.2	41.1	41
Methanol Wt., % MeOH	90.0	90.0	90	90.0	89	88
Caustic Ratio, Vol.—% of gaso.	5.2	5.2	5.8	4.9	4.5	...
Meth. Ratio, Vol.—% of caustic	20.6	20.6	20	20.6	20.3	...
Caustic Stripper:						
Steam to regen., lb./hr.	2670	2670	3260	3210	3260	3260
Temp., superheater outlet, °F.	850	850	800	900	800	800
Steam, lb./gal. caustic	10.1	10.1	9	9.1	9.2	9.1
Steam, lb./bbl. gasoline	22.2	22.2	22.3	18.9	17.2	13.6
Steam, lb./gal. methanol	49.4	49.4	45.2	43.8	45.2	45.2
Methanol Column:						
Feed, wt.—% Methanol	16.0	16.0	20	19.0	20	19
Reflux, BPD	25.8	25.8	32	27.8	27.9	31
Steam, lb./hr.	1960	1960	2260	2250	2280	2190
Steam, lb./bbl. gasoline	16.3	16.3	15.4	13.2	12.0	9.1
Feed Source	Dubbs	Dubbs	Dubbs	Dubbs	Dubbs	Dubbs
End Point, °F.	375	375	375	375	375	375
Mercaptan, %	0.084	0.084	0.077	0.068	0.074	0.090
Mercaptan in product, %	0.0010	0.0010	0.0004	0.0020	0.0009	0.0009
Mercaptan reduction, %	98.8	98.8	94.8	97.1	98.8	99.0

* Feed averages 0.25% total sulfur; after treating, total sulfur averages 0.17%, largely as cyclic sulfur compounds, 0.001% or less as mercaptans.

Decoking Heater Tubes with Steam, Air Saves Time, Gives Satisfactory Results

One of the bottleneck jobs in a refinery is the cleaning of heater tubes when a unit is brought down for routine maintenance. It is a long, dirty and expensive job. However, a number of oil companies have adopted the practice of burning the carbon out of the tubes with steam and air; they report entirely satisfactory results as long as certain very necessary do's and don't's are carefully observed and they get the job done in one-tenth the usual time required.

Among the advantages of burning carbon out against removing it mechanically are (1) the very clean job produced, (2) speed of cleaning (six to ten hours normally is sufficient) and (3) no need to use a polisher or to remove more than a few random-selected header-plugs for inspection of the job unless a complete tube inspection is desired. The main disadvantage is that the heater must be carefully watched all during the burning process to be sure that the tubes do not get too hot and lose their heat treatment. It is this possibility that has caused some plant managers to decide against the method.

Stated in simplest form, the method involves blinding off inlet and outlet lines of the heater, connecting steam and air lines by a "Y" to one side of the heater and a discharge line to the other end of the coil by means of headers which permit flow reversal periodically. The Y-connection should carry a pressure gauge, by which the ratio of steam and air is determined, and the discharge line should have a water quench. Such an arrangement is shown in the sketch. As soon as the heater is taken off-stream and after the regular steaming-out is completed, steam is started, its fires are lit and temperature is brought to 1150-1300° F.

Keep Color Below Medium Cherry Red

Air may be introduced occasionally or continuously, but the tubes where burning is taking place should not be allowed to exceed a medium cherry red. It will be observed that one or two tubes will have a red spot or spots one to two feet long which move with about the speed of a minute-hand. When the red spots disappear, at the end of the coil, fires are pulled and air is admitted to the setting; later, when the furnace temperature is down to about 500° F., water is passed through the tubes to complete the cooling.

The decoking of tubes with steam and air is accomplished by three mechanisms, of which the first two are said by some engineering firms to be the most important:

Mechanics of Decoking

1. Shrinking and cracking the coke loose by heating the tubes from the outside, with steam flow blowing the coke from the coil.

2. Chemical reaction of hot coke with steam whereby carbon monoxide, carbon dioxide and hydrogen are produced.

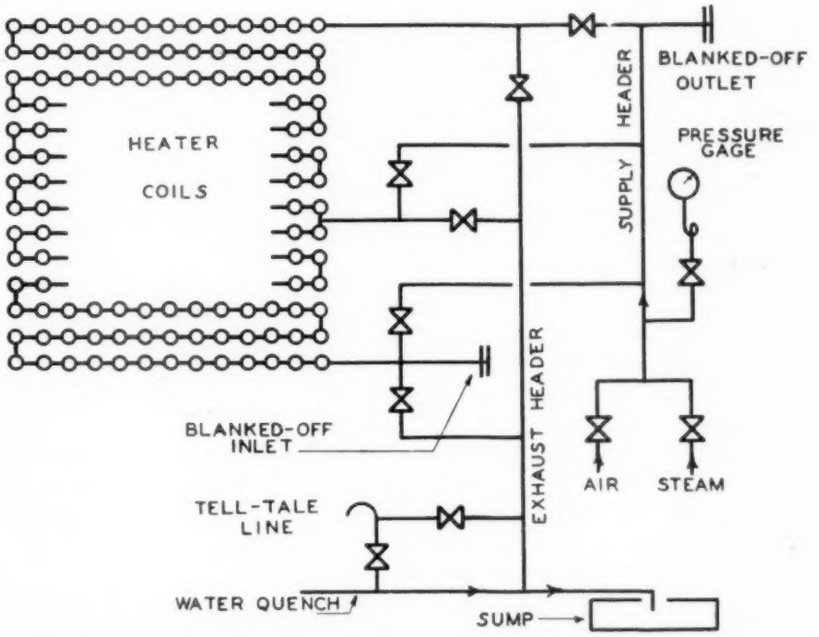
3. Chemical reaction between coke and oxygen of the air to produce carbon monoxide and dioxide.

At some plants air is continuously fed into the steam during the process. At others air is used only intermittently. The procedure at one plant is not to reverse the flow, and use air continuously. Steam pressure is about 15 psi at the coil inlet, while air pressure varies from 10-15 psi, for a total of 25-30 psi back pressure at the coil inlet. Steam alone is circulated until furnace temperature reaches 1100° F., when air is cut in. A thermocouple located in the hip-section of the roof is used as heater temperature control point, and dampers are adjusted to maintain temperature here at 1150° F. Rate of coke burning is controlled by increasing or decreasing steam flow.

As soon as burning is over—indicated by absence of red spots on the tubes—fires are pulled and steam blowing maintained for a minimum of two hours—or until furnace temperature is around 500° F—after which header doors are opened and air admitted to the setting. Final cooling is attained by water-wash. At this particular plant, as well as some others, plugs in return bends are removed and tubes given a final polish. At another plant, polishing is necessary particularly because the crude is limited prior to charging and the decoking obviously will not remove these deposits. Theoretically no polishing is necessary.

Re-tooling Suggested After First Burning

One plant manager particularly cautions against opening header doors earlier than after two hours of steam blowing as predisposing towards loosening tubes at the roll from contraction. This same superintendent suggests also that all tubes be re-rolled after a heater is burned out for the first time. A touch-up is all that is required as a precaution against leaks and usually is not required



Schematic arrangement of piping for decoking heater tubes with steam and air

again. It is necessary the first time because small leaks previously may have been plugged by carbon, which will have been removed during the burning.

In one plant, the assistant superintendent estimates the burn-out method of decoking requires 12 man-hours against 180 formerly required for turbining. Two men are required for the six-hour job and then, as far as the heater is concerned, the unit is ready to go back on-stream. Steam and air requirements are nominal—steam used approximates the consumption of a single medium-sized crude oil charge pump and air consumption is about two-thirds of this volume.

The amount of time required for de-coking of course, will depend upon the size of the heater and its condition. Quite naturally, a badly-coked unit will require longer to burn out than one that doesn't contain too heavy a deposit. The time saved as compared to turbining will also depend upon the type of furnace, since some types are easier to work on than others.

General Method Described Further

One engineering firm gives the following additional description of the general method for burning out coke:

1. Steam is introduced through the heater, the burners are lit, and the temperature of the heater is brought to 1150°-1300°—when a copious discharge of soot is obtained from the telltale line on the discharge header. Air is introduced only occasionally to induce a heavy spalling of coke, and is cut off as soon as the spalling proceeds satisfactorily.

2. The flow of steam, or steam and air, is reversed through the coil every 20 to 45 minutes until coke burning is complete. Each burning with air and steam is accompanied by a blowing-out operation with steam only during which the reddish ash is discharged from the heater.

Sufficient steam is passed through the tube bank to give a steam inlet pressure of 60-125 psig with atmospheric discharge, depending on the size of the heater and the number of tubes in series. When rather coarse coke particles are being discharged in large quantities, the quantity of steam is reduced to approximately one-half this amount to reduce the velocity of these particles and to reduce their "sand blasting" effect.

Quench Water Tells Progress

The amount of air supplied is controlled to give approximately 10-20 psi raise in the total pressure at the inlet, that is if 100 psi on the inlet is obtained with steam alone the quantity of air admitted is regulated to obtain 110-120 psi.

Water is used to quench the products of combustion from the tubes and to carry away the coke particles and soot. The progress of the de-coking operation can be easily observed by watching the water discharge from the discharge header, or better yet, by watching a special telltale line installed on the header. Before the beginning and after the completion of the de-coking when the coke is dried a grayish milky stream is discharged from the header. When fine particles of coke, the fineness of average soot, are discharged, the color of the water is light gray. The color of the discharge deepens until it is almost black as the coke particles increase in size and number. During the blowing-out cycle the discharge is reddish-brown. In general, the progress of each stage of de-coking is indicated by the change in color and the intensity of color of the discharge from the header.

"Glow Test" Is Final Check

The completion of the burning is indicated by the disappearance of any red spots on the tubes when air is used. A "glow test" is used as a final check to determine the completion of the operation. The water is cut off the telltale line and a glowing piece of wood is brought in front of the telltale line in the discharge header. If the coke is not fully burned the embers will be extinguished by the products of combustion. If the glow increases in brightness, products of combustion are absent and the burning operation is completed.

As a general rule, no turbining is required after the de-coking. The final blowing out of the soot and the small amount of oxide formed in the tubes usually leaves them as clean as they can be made with an average polishing operation.

According to the opinions of metallurgists with tube manufacturers and steel companies, this method of de-coking should not affect the physical properties of the tubes, even those made of the 4—6 chrome-molybdenum steels, if the top temperature limit is not exceeded. The de-coking is carried out at metal temperatures considerably below the lower transformation point.

Less Metal Loss Claimed

A small amount of oxidation of the inside of the tubes, which results from this method of de-coking and which is demonstrated by the discharge of the reddish ash when the bank is blown with steam after de-coking with steam and air or air alone, results as a general rule in a smaller metal loss than is normally obtained with the use of knockers and other mechanical cleaning tools.

This method of de-coking does not affect the tightness of a properly made roll since both the tube and header are kept at approximately the same temperature during the de-coking operation by this method. However, if the original roll was imperfect, and was sealed by coke formation during operation, this method of de-coking may burn out the coke and unseal the joint. This may require rerolling of the joint, particularly with light feeds such as naphtha and gasoline which do not coke up easily.

Four Trouble Points in a Catalytic Cracker And How One Refinery Has Solved Them

When Eastern States Petroleum Co. Inc., installed its Fluid Catalyst Cracking unit at Houston for the wartime 100 octane gasoline program, a number of points in the unit gave troubles which had to be corrected immediately, and oftentimes by rule-of-thumb preventive methods or ingenious solutions without worrying much about how or why they worked.

Four of the major trouble points are shown in the drawing, which indicates the solution of the difficulty as well. These include (1) provision for maintaining back-pressure on the regenerator to reduce catalyst losses, (2) liner for the first 90° bend in flue-gas transfer line to stop erosion of ceramic and pipe, (3) curtain-liner for bottom regenerator cone to reduce catalyst erosion or development of "hot-spots" in the shell, and (4) similar liner for spent catalyst transfer line.

These problems may not be troublesome in other Fluid units, of course, or their solutions as outlined here may not work under different conditions, but they may give other refiners an idea of how they can approach their own difficulties.

Before any of the these problems were solved, there was another job of immediate and major importance: the cast alloy grid in the regenerator failed by cracking, due to pulsation and vibration. A new one was not immediately available and the unit was "on its back". Despite the fact that ordinary carbon steel is not supposed to withstand 1100°F. operating temperatures, the chief engineer and chief inspector agreed there was nothing else to do but make and install a replacement grid of carbon steel and hope that it would last until the alloy grid could be obtained.

"Temporary" Grid Still in Use

Accordingly, a new grid-plate was made of ⅞-in. steel containing 0.15-0.20% carbon. It was fabricated and supported to exactly conform to the original cast alloy plate. The "temporary" plate still is in use after more than two years. This result astonished everyone and no reason supported by theory has been ad-

vanced as to just why it did not burn out within a few weeks. When—and if—it does go out, the company plans to install a new one just like it.

When the FCC unit first went on-stream catalyst losses were high. Units which have been built since are equipped to maintain about 4 psi. back-pressure on the regenerator chamber. This results in a reduced catalyst load on the multicones and Cottrell precipitators, thus increasing their efficiency and reducing catalyst losses to the stacks. But this unit was not so equipped. An adjustable orifice was the solution, as shown in Detail 1.

Plate Has Oblong Hole

The orifice plate also was made of plain carbon steel, having an oblong hole in its center instead of the conventional shape. The stem from an old 4-in. gate valve was welded to an oblong steel plate, two such assemblies being made. The bonnets from the gate valves then were welded to the flue gas transfer line, one on each side, a short distance from the top of the regenerator. Working in guides against the orifice plate, the plates are run in or out until back-pressure on the regenerator reaches the desired value. As they become eroded away by the catalyst, or burned by the 1100° F. flue-gas, the adjustable plates are run in a small amount to compensate. Eventually, as they are worn away, it is necessary to make replacements.

When the orifice-plate assembly was installed in the flue-gas transfer line, it was found that considerable erosion was taking place in the first 90° bend downstream of the orifice because of the increased velocity its presence imparted to the gas. Some erosion from the change in direction of the catalyst-bearing gas already had been noted.

The obvious solution was to install a metal half-lining at the point of erosion. Since carbon steel had worked so well as a grid plate in the regenerator, and flue-gas temperature was the same, 0.375-in. thick 0.15-0.20% carbon steel again was used. The new joker was to install the curtain over the ceramic lining of the pipe; it was met by simply bolting the curtain in place with ordinary ⅞-in. stud-bolts, the nuts of which promptly welded to the plate because of the high temperature involved. This installation, Detail 2, is a comparatively recent innovation on the unit and it is not known as yet how frequently the liner will require replacement but, judging from past experience, it should stay through several turn-arounds.

Several "Hot Spots" Developed

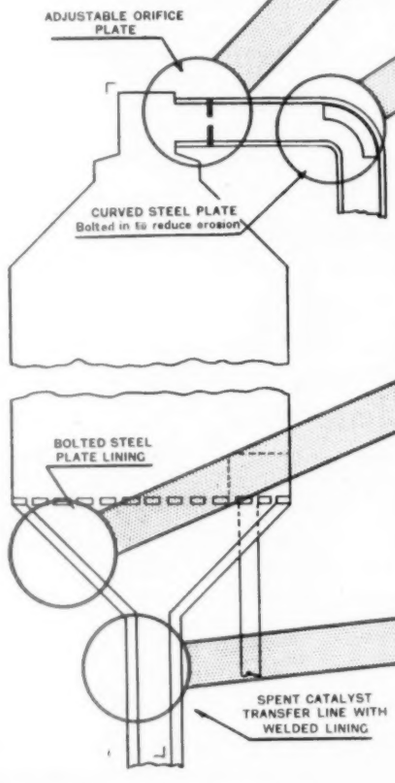
"Hot spots" developed in the spent catalyst transfer line as well as in the shell of the bottom regenerator cone. Investigation revealed that the catalyst and regeneration air at 1100° F. was by-passing the lining and getting in behind it. Also, there was some evidence of erosion in the transfer line, particularly. Solution of the difficulty called for the installation of a curtain-liner over the insulation.

Two methods of attachment were used for the curtain-liners. Lining for the regenerator (Detail 3) was bolted in place with ordinary ⅞-in. stud-bolts welded to the inside of the vessel shell and extending through the brick insulation. This liner was of 0.5-in. thick low-carbon steel sheets, approximately 3 ft. wide at the top, with provision for expansion consisting of 1-in. gaps protected by stitch-welded flaps and slotted holes for the bolts. Due to the high temperature, the stud-bolt nuts "weld" to the lining—a mixed blessing since this prevents the nuts from loosening or coming off but will necessitate cutting the bolts when relining becomes necessary.

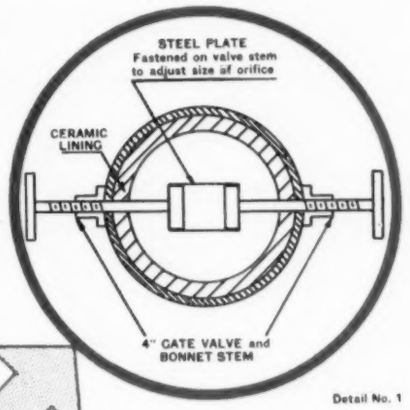
Other Liner Welded in Place

The transfer line liner (Detail 4) was welded in place, being made from 18-in. nominal steel pipe, 0.375 in. wall and 0.15-0.20% carbon. Expansion gaps, located every 6 ft., are 1½-in., the lining beneath the gap being protected by flaps stitch-welded to one of the adjacent plates. Insulation is "Aluminite-Haydite" cement, poured in place after the curtain liner was installed.

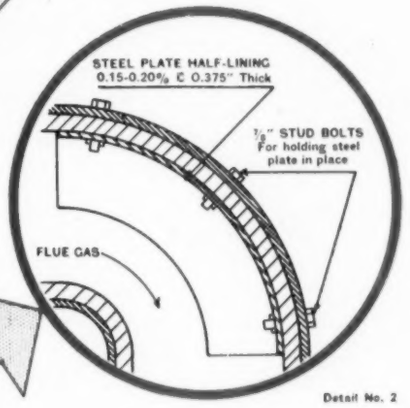
No "hot-spots" have been noted since the linings were installed, and it has not been necessary to replace them despite the high temperature. Shell and line temperatures generally remain at 200° F.


ADJUSTABLE ORIFICE PLATE
CURVED STEEL PLATE Bolted in to reduce erosion
BOLTED STEEL PLATE LINING
SPENT CATALYST TRANSFER LINE WITH WELDED LINING

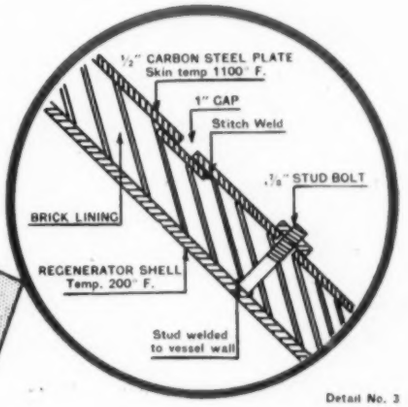
Sectional view of FCC reactor. . . .



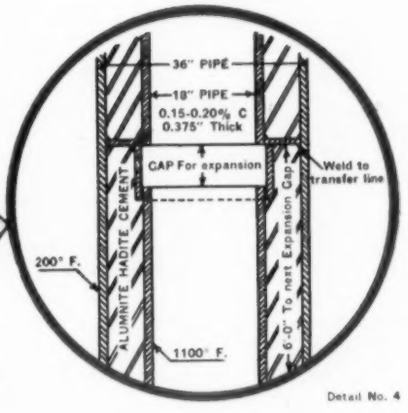
Detail No. 1



Detail No. 2



Detail No. 3

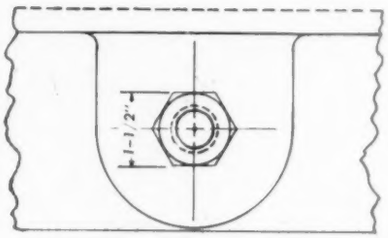


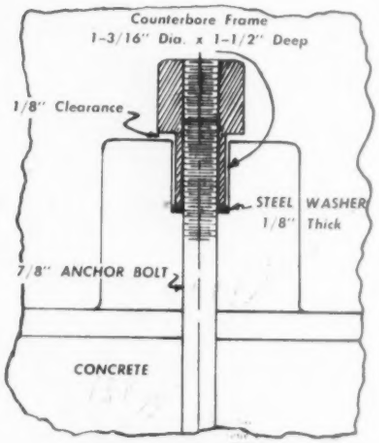
Detail No. 4

. . . .and details of trouble-points

Special Nut Permits Re-use of Broken Anchor and Bearing-Wedge Locking Bolts

All too frequently anchor bolts or bearing-wedge locking bolts on compressors and other types of refinery equipment become broken or damaged. To replace them requires considerable down-time on the item. In the case of anchor bolts, for instance, it is necessary to repair or regrout the foundation for the compressor in replacing the bolts. Generally the bolt will not be broken off so short that none of the threads are usable, but usually short enough that the nut will not engage sufficient threads for safety.





Machining details for special sleeve-type nut, which permits re-use of remaining threads on broken anchor and bearing-wedge locking nuts

One of Humble Oil & Refining Co.'s mechanics developed a special threaded sleeve-nut — an anchor-bolt coupling — which permits utilization of the remaining threads on the bolt to permit retightening. His idea was used on three compressors where a number of anchor bolts were broken. While it does not eliminate ultimately making permanent repairs by regrouting the compressor foundations, its use has prolonged life of the present grouts by at least 20%.

This method also has been used to eliminate immediate replacements of broken locking bolts for the main bearing-wedges on three wellknown makes of compressors, saving the direct cost of replacing the broken bolts as well as increased down-time on the compressors.

In practice, frame of the compressor is counter-bored as shown in the illustration 1½ in. deep and 1/16 in. oversize on the diameter of the sleeve (1⅜ in. in the example shown). A sleeve-type nut is made, having a 1½-in. hex. head, 1½ in. sleeve 1⅛ in. diameter, drilled and tapped for a ⅞ in. bolt.

A washer, ⅛ in. thick, is dropped in the special bolt-hole in the frame before the special nut is run down. This gives a ⅛ in. clearance between shoulder of the nut and the frame, compression being transmitted to the frame through the washer.

Wanted—IDEAS!

Plant operators, foremen and superintendents are invited to send in their own contributions of "how we do it around our refinery". Possible subjects could include maintenance and repairs ideas, inspection procedures, operating shortcuts — anything which has made your refinery more efficient and easier to run. Include photographs, drawings or sketches, if available.

Material accepted for publication will be paid for at our regular space rates. Contributions should be addressed to:

Plant Practices Editor
National Petroleum News
Technical Section
1213 West Third Street
Cleveland 13, Ohio.

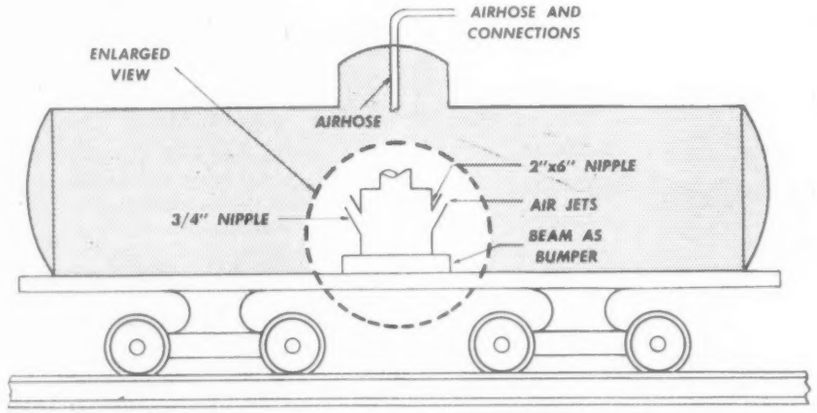
Simple Air Jet Cools Tank Cars Quickly

A large Gulf Coast refinery uses a specially-constructed jet to assure maximum air circulation in tank cars to cool them quickly after steaming and to provide breathable air when it is necessary for employes to enter for cleaning or other operations.

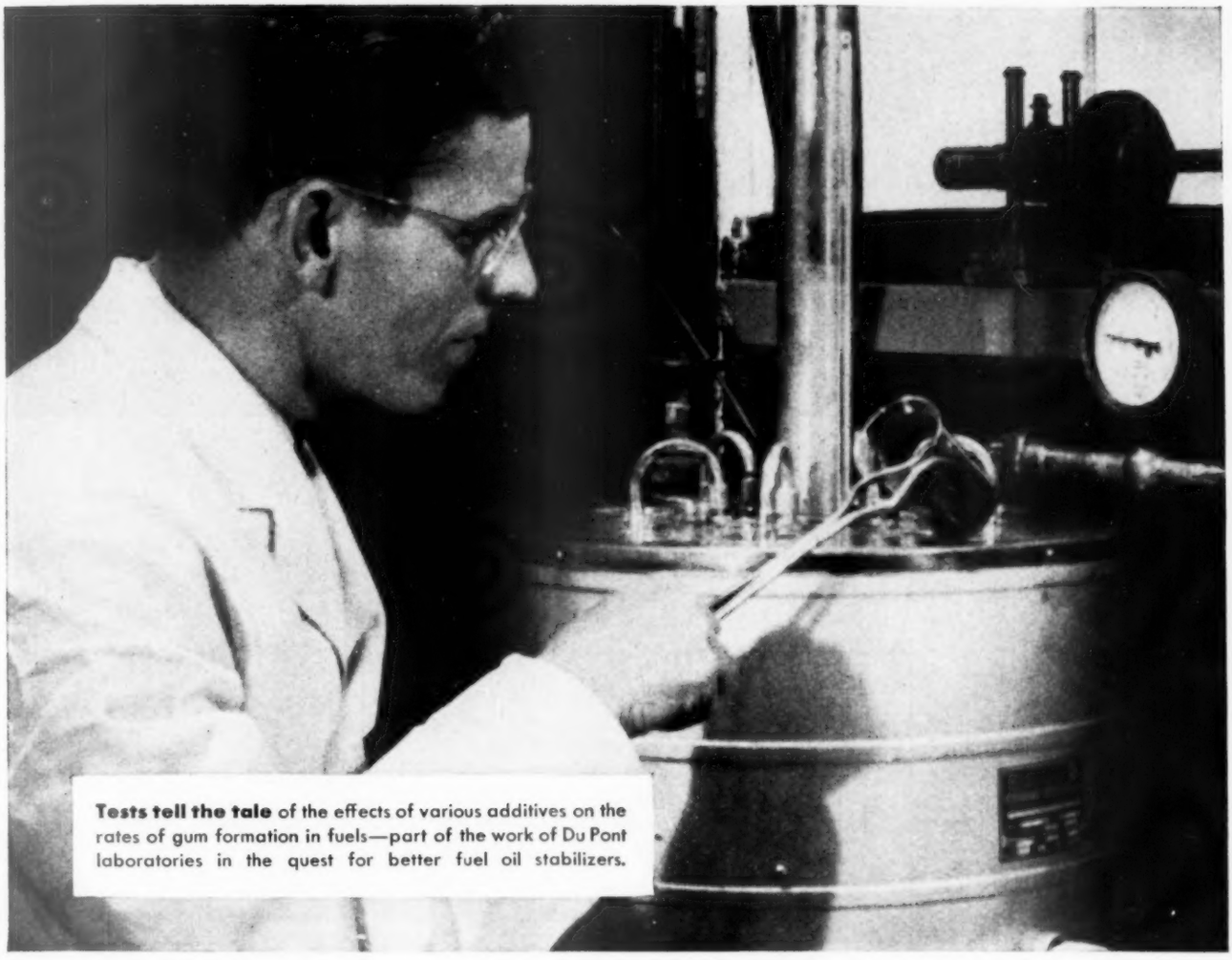
The device has three advantages: (1) It reduces cooling time. (2) It adds to employe comfort and safety by assuring maximum circulation of fresh air. (3) It removes scale from the shell of the car by cracking it loose (thermal shock) and blowing it down to the bottom of the car.

Illustrated in the drawing, the device consists of two ¾-in. nipples welded into a 6-in. nipple at an angle of 45° to the long axis of the nipple. A short ¾-in. nipple is welded into the 2-in. nipple for an air-hose connection, and the long nipple is welded to a 4-in. beam 2 in. long to serve as a base. Eye-bolts welded to each end of the beam and a halter inserted through them permit a rope to be attached for raising and lowering the assembly to desired height.

In use, the jet is lowered to the bottom of the car and yard-air turned on. When the car has cooled sufficiently after steaming to permit an employe to enter, the jet may be cut to part-throttle and raised to the desired height, thus keeping heat displaced while work proceeds. Using this device the usual cooling time for ordinary cars is approximately two hours, four to six hours for insulated cars.



Enlarged view (not to scale) of special air jet for cooling and ventilating tank cars after steaming. It cools an insulated car in four to six hours, an uninsulated car in two hours, and then provides fresh air for employes working inside the car



Tests tell the tale of the effects of various additives on the rates of gum formation in fuels—part of the work of Du Pont laboratories in the quest for better fuel oil stabilizers.

How to Muzzle an Atom Before it Bites

OXYGEN ATOMS are easy on the lungs, but they can cause a lot of trouble in fuel oils. A few oxygen atoms here and there, by chain reaction, can contaminate a whole batch of oil with gum. And, if a catalyst is present, quickly, too.

For "muzzling" these atoms before they can chew up oil, Du Pont scientists have introduced a *new product*, Du Pont Fuel Oil Stabilizer No. 1. This compound, in tests on unstable fuels, shows pronounced value in retarding oxidation and the catalytic effects of metals. It was developed to help eliminate the necessity for costly treating processes. Try it *now* on the oils you are producing. Du Pont Fuel Oil Stabilizer No. 1 may help improve your position in this highly competitive market. Test procedures and samples will be supplied on request.

CONSULT DU PONT with your problems! Du Pont technical men, with years of practical experience in the laboratory and in the field, will work with you in selecting or developing the *right* materials to meet your *specific* needs. For more details, write to: E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

DU PONT

PETROLEUM CHEMICALS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

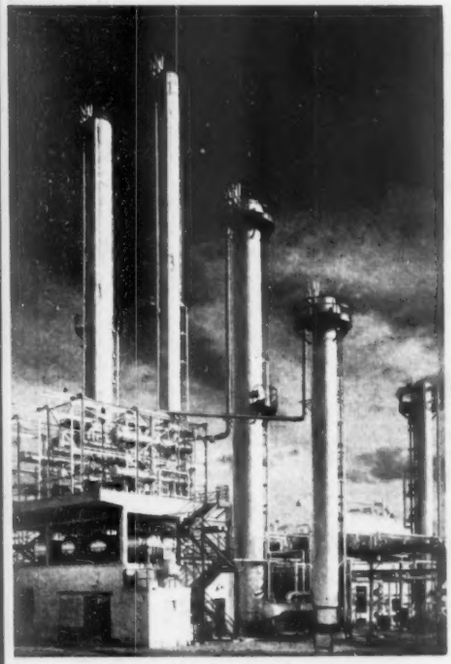
17 YEARS CONTINUOUS SERVICE TO THE PETROLEUM IN

● Varied processing problems of producing and refining property owners in nearly every part of the world have come under the scope of operations of Petroleum Engineering, Inc. during its 17 years continuous *specialized* service to the petroleum industry.

Here are some of the numerous gas processing plants . . . typical of more than 200 plants . . . designed and constructed by Petroleum Engineering, Inc. during those 17 years in France, Germany, Rumania, the United States and U.S.S.R.

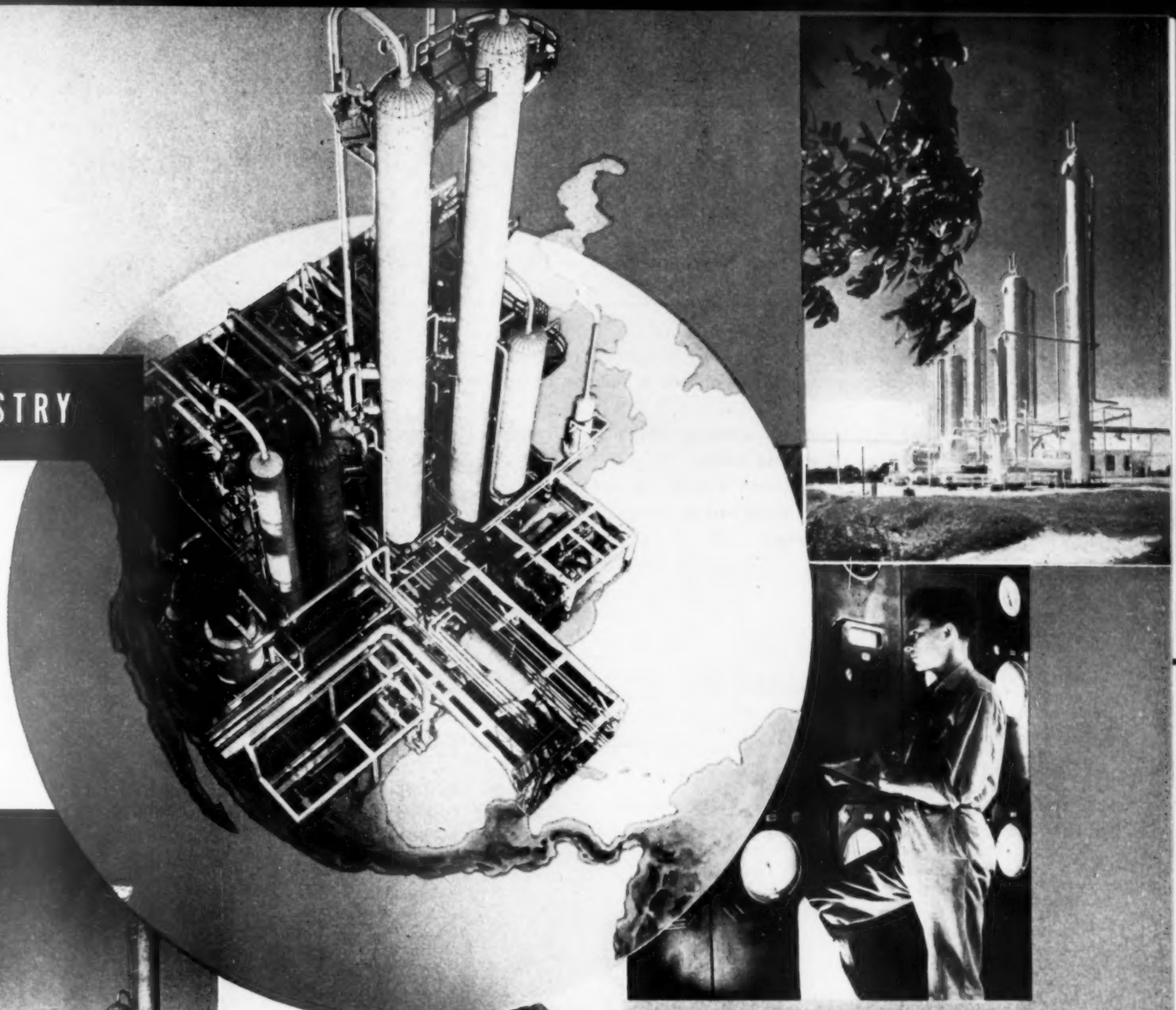
The same trained technicians and engineers . . . skilled in their respective specialties . . . who designed and built these plants are available for consultation on your processing problems.

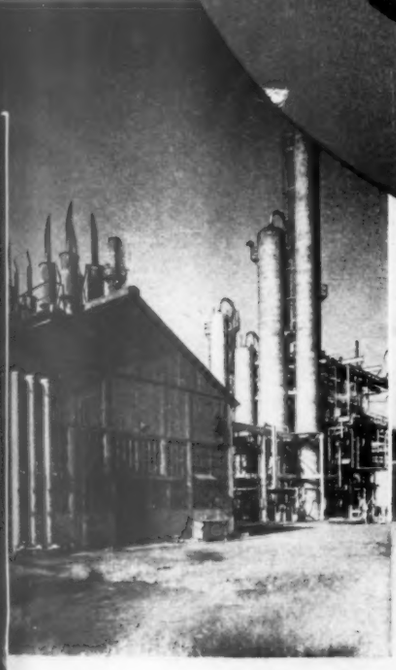
We specialize on Natural Gasoline Plants, Cycling Plants, Refinery Vapor Recovery Systems, Absorption Oil Purifying Units, Special Fractionators for production of Pure Hydrocarbons, Gasoline Stabilizers, Toluene Fractionating Plants, Topping Plants, Vapor Rectification Type Plants.

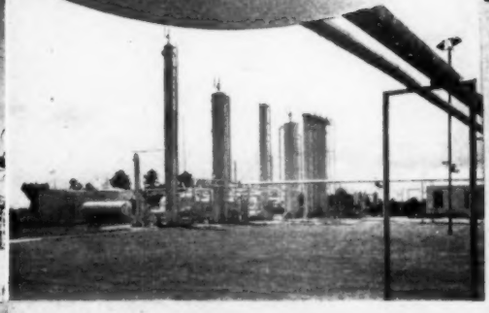


HOUSTON

EUM INDUSTRY







TON

PETROLEUM ENGINEERING, INC. TULSA

Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

VOULGARIS

Patent Trends in Petroleum Refining

By Peter J. Gaylor

Patent Attorney and Editor "The Technical Survey"

Recent developments disclosed in patents reviewed below include:

Solubilizing agent to keep amines in solution in high octane number gasolines.

Use of hydrindene to increase rich mixture response of paraffinic or naphthenic aviation base stocks

Improvement of gasoline stability by the addition of cyclo olefins.

The fact that employing two Br atoms to one Pb atom in TEL fluid minimizes engine corrosion.

Gasolines

In the production of high octane number gasolines, particularly those employed during the last war, various amines, such as xylidines, toluidines, etc. were used when rich mixture performance was important. Such amines were found to have a tendency to separate, especially at low temperatures. The addition of solubilizing agents such as low molecular weight alcohols and acetone was not successful since these compounds are water soluble and tend to dissolve water, which would crystallize out at low temperatures. Furthermore, the alcohols have rather poor antiknock properties in leaded fuels.

In its U. S. 2,398,197, Shell Development found it possible to **solubilize amines** without encountering the detrimental concomitant effects outlined above. This was accomplished by using an asymmetrical aliphatic ketone of 5-6 carbon atoms, such as methyl n-propyl ketone. An example of the use of such a solubilizer in a 0.5% aniline blend in 100 octane aviation gasoline containing 3% aromatics, is shown as follows:

Additive	Separation Temp. ° F.
None	—20° F.
1% Methyl n-propyl ketone	—58
3% Methyl n-propyl ketone	—94
3% Methyl isobutyl ketone	—83

Shell Development has also found that **hydrindene** (cyclotrimethylene benzene) is an aromatic hydrocarbon having the property of greatly increasing the **rich mixture response** of paraffinic or naphthenic aviation base stocks to which it is added. Its U. S. Patent 2,399,413 points out that hydrindene of 90% purity, produced by reduction of indene, had an ARV (alkylate replacement value) of 2.3.

Since hydrindene has a boiling point of 350° F., which is somewhat high for aviation fuel, it is necessary to employ base stocks (to which it is added) having boiling ranges substantially below the allowable upper boiling range limits which call for maximum ASTM boiling temperatures at 90% evaporated between about 257° F. and 300° F. Preferably, at least 3% of hydrindene is employed.

In another of its patents, (U. S. 2,402,-863), Shell Development points out that cracked gasolines always have been considered relatively unstable because they contain olefins. Such stability has been held to be aggravated further by presence of tetraethyl lead.

In its patent, it claims to have discovered that certain **cyclic olefins,** preferably those containing the C_6 cyclo olefin ring, in amounts up to about 10% in various gasolines, **tend to stabilize the gasolines,** rather than render them unstable. Such gasolines may contain up to 5-6 cc./gal. of lead, and preferably should contain effective amounts of an oxidation inhibitor. Usually, the content of cyclo olefins in gasoline is quite low, below about ½%, so that addition of cyclo olefins generally results in some improvement.

The effect of cyclic and aliphatic ole-

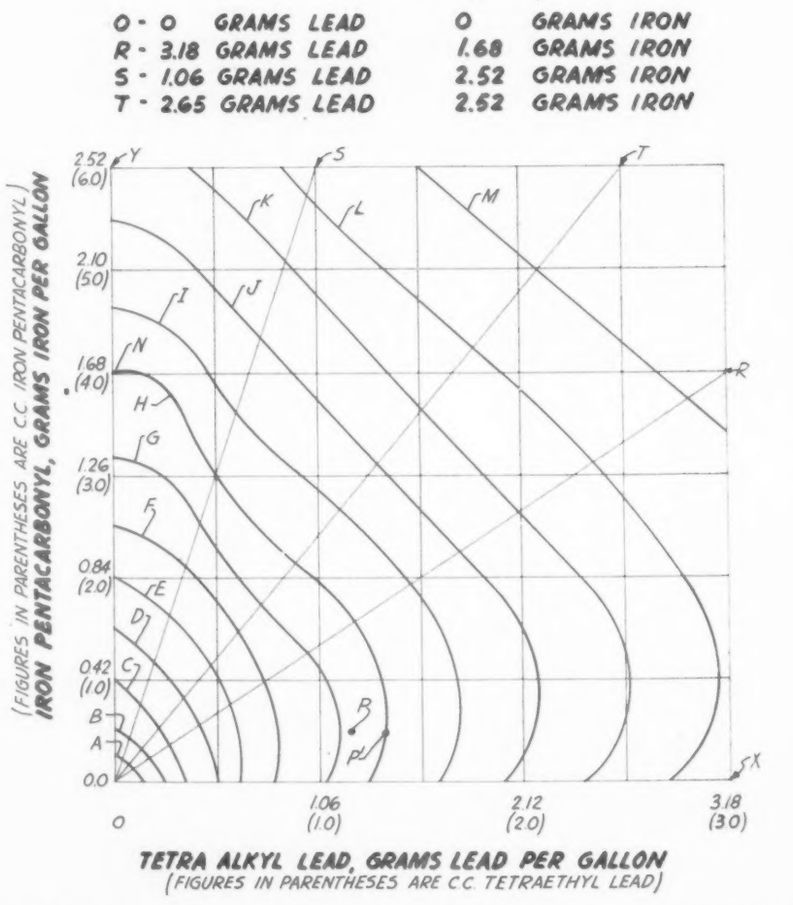
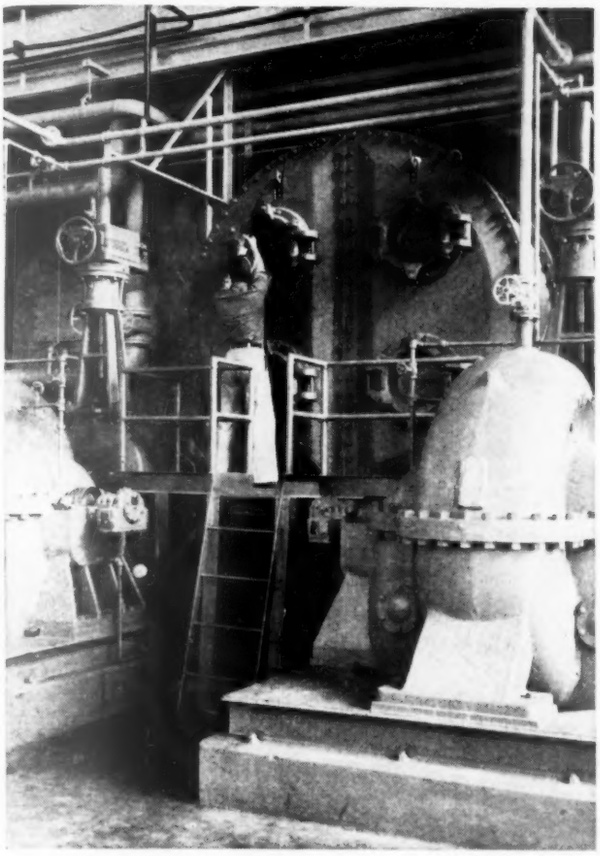

O - O GRAMS LEAD 0 GRAMS IRON
R - 3.18 GRAMS LEAD 1.68 GRAMS IRON
S - 1.06 GRAMS LEAD 2.52 GRAMS IRON
T - 2.65 GRAMS LEAD 2.52 GRAMS IRON
(FIGURES IN PARENTHESES ARE C.C. IRON PENTACARBONYL)
IRON PENTACARBONYL, GRAMS IRON PER GALLON
2.52 (6.0)
2.10 (5.0)
1.68 (4.0)
1.26 (3.0)
0.84 (2.0)
0.42 (1.0)
0.0
0
1.06 (1.0)
2.12 (2.0)
3.18 (3.0)
TETRA ALKYL LEAD, GRAMS LEAD PER GALLON
(FIGURES IN PARENTHESES ARE C.C. TETRAETHYL LEAD)

Fig. 1—Antiknock values of mixtures of tetraethyl lead and iron pentacarbonyl blended in an Indiana base. Each line, A to M inclusive, indicates a mixture of constant antiknock value, with line A having the lowest and line M the highest. Note how the use of only a small amount of iron pentacarbonyl in some cases requires the use of more lead to maintain the same octane rating

DOWELL



Original efficiency restored

—with Dowell chemical cleaning!

Leading plant engineers rely on the Dowell *chemical* method of removing scale and sludge from heat-exchange equipment—to restore rated capacities, to meet production schedules, and to maintain peak loads over long periods of time.

Dowell offers a complete service—including preliminary inspection, scale analysis, and the selection of proper chemicals to accomplish rapid cleaning. Dowell specialists bring with them adequate equipment to control every stage of the successful treatment.

Call the nearest Dowell office for a free estimate. Ask for "More Power to America's Industry"—free color booklet which explains Dowell's thorough Chemical Cleaning Service.

FREE SHOWING! Now available—a new 18-minute sound slide film illustrating the possibilities of Dowell Chemical Scale Removal Service. A Dowell representative will gladly arrange a special showing at your plant, office or organization meeting. Call or write Dowell today.

DOWELL INCORPORATED • TULSA 3, OKLAHOMA

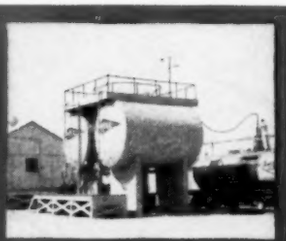
Subsidiary of The Dow Chemical Company

New York • Philadelphia • Baltimore • Buffalo • Cleveland • Cincinnati
Chicago • Detroit • St. Louis • Houston • Kansas City • Wichita
Pittsburgh • Mt. Pleasant, Michigan • Salem, Illinois • Lafayette, Louisiana
Long Beach, Casper: Dowell Affiliate—International Cementers, Inc.

SPECIALISTS IN CHEMICAL CLEANING SERVICE

Dowell's experienced industrial engineers are backed by the complete research and technical facilities of The Dow Chemical Company.

Dowell's equipment is modern and complete—scientifically designed. Treating stations and chemical warehouses conveniently located.



Dowell cleaning solvents are "tailor-made" to fit each job. All ingredients are of the highest quality, chosen for best results in your plant.

DOWELL

FOR INDUSTRIAL CHEMICAL SERVICE

fins, respectively, on gum time of an alkylate gasoline containing 4 cc. TEL and 0.005% N,N′ dibutyl p-phenylene diamine inhibitor is demonstrated by Table 1. It will be observed that cyclohexene increases stability markedly, while diisobutylene reduces it somewhat.

TABLE 1—Effect of Cyclic Olefins on Gasoline Stability*

Olefin	% Added	5 mg. A.S.T.M. Gum Time, Hrs.
None		23.2
Cyclohexene	½	40.0
	2	96+
	5	96+
	10	59.5
Diisobutylene	½	22.0
	2	21.4
	5	22.4
	10	22.4

* U. S. Patent 2,402,863, Shell Development Corp.

Ethyl Corporation brings out in its U. S. 2,398,281 that **corrosion of engine parts during use of leaded fuels** is best minimized by employing two atoms of bromine to one atom of lead in the lead fluid. Attempts have been made to substitute chlorine for bromine, but they were successful only when small substitutions were involved. One commercial practice involves 0.70 theory of bromine and 0.45 theory of chlorine. This gives good results in ordinary operation but, under heavy duty conditions, there is an accumulation of lead deposits and exhaust valve life is reduced.

It has been found that a corrective agent containing bromine and chlorine, with the chlorine preponderating, can give improved results, if the proportions are held within a definite range, as shown by a chart which has been provided. A corrective agent having one theory of chlorine and one-half of bromine gives results comparable to one theory of bromine. Such an agent may be made by admixture on a volume basis of 404 parts ethylene dichloride and 220 parts ethylene dibromide for use with 1000 parts tetraethyl lead.

In its U. S. 2,398,282, Ethyl Corporation shows that, although the use of tetraethyl lead or iron carbonyl alone usually gives improvement in antiknock properties, a mixture of the two may give a negative effect, depending on the ratios employed.

A chart has been prepared illustrating the antiknock values of different **mixtures of tetraethyl lead and iron pentacarbonyl** in an Indiana base sold during 1935-41, using the ASTM motor method.

In Fig. 1, the horizontal axis OX indicates the quantity of lead alkyl in the mixture per gallon of fuel, while the vertical axis OY indicates the quantity of iron carbonyl in the mixture per gallon of fuel. Each line, A to M inclusive, indicates mixtures of constant antiknock value. Mixtures indicated by line A have the lowest antiknock value, and lines lying to the right of A indicate mixtures of progressively higher antiknock value.

Useful mixtures of iron carbonyl and tetraalkyl lead lie within the area bounded by the lines OR, OS and NR inclusive. Because of the lower cost of iron carbonyl, it would appear that all mixtures should be chosen near the line OS. Its lower boiling point also suggests this inasmuch as the antiknock mixture will be more evenly distributed during periods of poor fuel distribution. Where engines preignite, mixtures having relatively high iron carbonyl content should be used because the products of combustion remaining have a less tendency to preignition. High carbonyl content is also desirable during rich mixture operation.

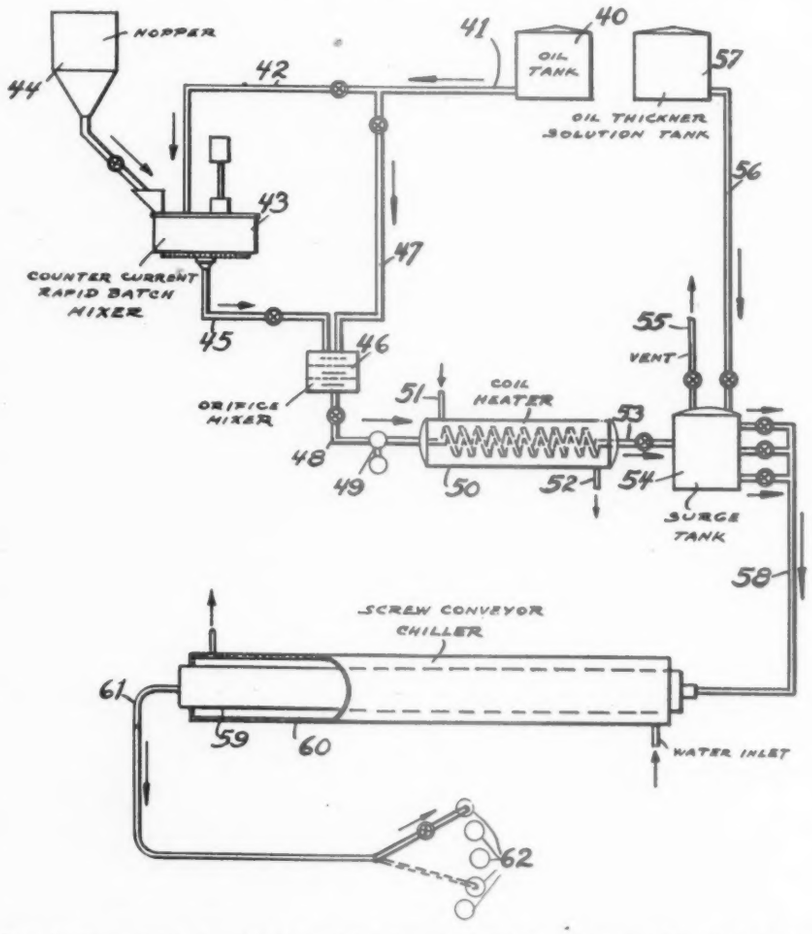


Fig. 2—Flow sheet of method used by Standard Oil Development Co. (U.S. 2,394,567) for incorporating phenolic compounds in aluminum grease blends during process of manufacture

Lubricants

One method for producing **heavy metal soaps** of fatty acids, employed by duPont, consists in passing a fatty acid and air into a reaction zone charged with the heavy metal fragments (Pb, Cu, Cd, Zn, Fe, Ni, Ag or Sn), conducting the reaction there at 50-200° C., withdrawing the heavy metal salts and unreacted acid with sufficient recirculation to inhibit settling within the reaction zone (U. S. 2,395,307). At the end of 3-4 hrs., an 85% conversion to soap is claimed to be obtained with lead and coconut oil acids.

Some Standard Oil Development Co. workers have found that when small quantities of phenolic compounds are incorporated in **aluminum grease blends** during the process of manufacture, the composites may be cooled rapidly with agitation to temperatures as low as 50° F. in layers ¼" thick, without granulation or decomposition. The phenolic compounds may be phenols, alkyl phenols, and naphthols. One such composition described contained the following ingredients:

Aluminum Stearate	6.5%
Tert. Octyl Phenol	0.75
Lube Oil (200 S.U. Vis./210° F.)	14.0
Polybutene	0.25
Lube Oil (70 S.U. Vis./210° F.)	78.5

The method of preparing the grease is shown in Fig. 2, which is self-explanatory (U. S. 2,394,567).

Refinery Wastes Can Stop Oxygen Supply Causing Water Pollution and Killing Life

Article 8 in a Series—By W. B. HART

In Charge of Waste Disposal for Atlantic Refining Co.

Refinery wastes can seriously reduce or even cut off entirely the supply of dissolved oxygen present in surface waters receiving waste discharges. Without this oxygen supply, which is an essential factor in a stream's plant and animal life, the purity and usefulness of a waterway is impaired, since it is incapable of self-purification.

In this eighth of his series of exclusive articles for NPN Technical Section, Mr. Hart discusses the factors which affect the oxygen supply of a waterway, and the various effects which a low oxygen content will have. Suspended solids, taste, odor and color, all vital characteristics in municipal water supplies, are also covered.

OF ALL the various factors which contribute to the cleanliness of surface waters, dissolved oxygen is one of the most important. It is from the supply of dissolved oxygen that the many forms of plants and animals which contribute to surface water cleanliness take their needs for life. It is essential to practically every living thing in the waters. Although some bacteria can obtain their needed oxygen from various chemical substances such as nitrates and so forth, these life forms are not great in number when compared with the vast variety of other living things present in water.

Dissolved oxygen is essential either directly or indirectly for most uses of surface waters. It is essential directly for such uses as commercial and recreational fishing of all kinds, for there would be no fish, either finny or shellfish, without it. The crustaceans such as shrimp, the mollusks such as oysters, and snails and the various other fresh-water and salt-water food animals, some of which are regarded as delicacies, must have dissolved oxygen to live.

Dissolved oxygen is also essential to many uses of water indirectly, because of its role in water cleanliness. Its role in the process of stream self-purification has already been described. The chemical and biological activities which occur in the absence of dissolved oxygen have also been considered.

Extensive investigations have been conducted on various bodies of surface waters to determine the dissolved oxygen content. These investigations show a range of from 5 to 6 p.p.m. to 8 or 9 p.p.m. in waters which can be regarded as clean. Concentrations within this range will provide an oxygen supply ample for self purification of the waters and for the respiration of the life forms they contain. Neither of the limits of the range given represent complete saturation except, perhaps, in warm waters. Few natural bodies of water are saturated at all times for there is continual demand upon the dissolved oxygen supply by the life forms and by the oxidizable organic matter naturally present in the waters. The rate at which dissolved oxygen is introduced into the waters is so correlated with the demands, that in clean waters, under natural conditions, there is always a balance within the range mentioned above.

The natural demand on the dissolved oxygen in surface waters is a biochemical demand. The mechanism of biochemical oxidation forms a specialized subject in itself. It is sufficient to say here that the oxidation is brought about by bacteria through the agency of enzymes, which act somewhat in the manner of catalysts. Phelps[112] discusses this subject very adequately. It is the action of self-purification in natural waters.

Oxygen Demand Also Chemical

But when certain petroleum refinery wastes (waste caustic, emulsions, grease constituents, and so forth) are discharged into surface waters in untreated form, not only do they place additional biochemical oxidation load (withdrawal) on the dissolved oxygen supply, but also another type of oxygen demand which is often termed a "chemical oxygen demand".

Chemical oxygen demand, as the name implies, involves chemical action. It may take any one of three major forms. The first of these is the simple addition of oxygen, which may be illustrated as follows:

$$2Na_2S_2O_3 + 3O_2 \rightarrow 2Na_2SO_4 + 2SO_2$$

The second oxidation reaction takes the form of removal of a hydrogen molecule, and may be illustrated by the oxidation of succinic acid to fumaric acid:

$$COOH \cdot CH_2 \cdot CH_2 \cdot COOH \rightarrow$$
$$COOH \cdot CH \cdot CH \cdot COOH + H_2$$

Finally, there is the form of oxidation in which electrons are removed from an atom or a molecule, as in the oxidation of ferrous iron to the ferric state:

$$Fe^{++} \rightarrow Fe^{+++} + \text{Electron}.$$

Any one of these oxidations are possible when refinery wastes are discharged without proper treatment into surface waters. Usually they take place very rapidly, so rapidly in fact that their effects have been designated at times as "immediate oxygen demand". One waste in particular, i.e., waste caustic has been shown in one instance to have such a high chemical oxygen demand that almost immediately upon admixture of but one barrel with the stream water, all the oxygen which the stream could carry in 24 hours was consumed. Probably the greatest portion of the oxygen demand in this instance was attributable to the high concentration of thiosulfates, sulfites, and sulfides in the waste, all of which were converted to sulfates at the expense of the oxygen in the stream waters. Thus, the oxygen balance was overdrawn.

The general effect of oxygen-consuming wastes upon surface waters can be summarized as shown in Fig. 1. It should be borne in mind that any wastes containing substances which are susceptible to either biochemical oxidation or any one or more of the forms of chemical oxidation, may contribute to the oxygen-depletion of surface waters into which the untreated wastes are discharged.

As indicated in Fig. 1, the ultimate adverse effect which can result from the discharge of oxygen-consuming wastes in untreated condition is to cause the waters to become septic, but lesser adverse effects may be aggravated under some conditions which are entirely natural. For example, when the weather is warm the temperature of the waters will be higher,

and consequently there will be less oxygen present to meet any oxygen demand. Also, at the more elevated temperatures some of the oxidation processes proceed at a higher rate, so that the effect in the immediate vicinity of the discharge (i.e., in lowering the oxygen balance) is more pronounced. This, however, tends to assist in the self-purification by the waters later. As opposed to this aggravation, bright, sunny, warm weather promotes the production of oxygen by photosynthesis, provided there are no otherwise adverse factors to interfere.

Ice Is a Factor

Where and when the weather is so cold that ice forms on the surface waters there is aggravation of the effects of oxygen consumption by wastes as a result of the ice coverage. The ice sheet has two effects. It prevents gaseous exchange between the water and the air, and it retards the penetration of light, and thus interferes with the supply of oxygen from the photosynthetic action of green plants. This condition may seem to be relatively unimportant in the immediate vicinity of the waste discharge. Here, perhaps, there will be no ice formed because of the elevated temperature of the waste as discharged. But if the waste has a high oxygen demand, as indicated in Columns 3, 4, and 5 of Fig. 1, its influence will extend far from the immediate discharge zone into regions where the ice cover exists. Then the rate at which the waters recover their normal cleanliness will be reduced.

Because they are the ultimate result of the effects on surface waters of untreated wastes which consume dissolved oxygen, septic conditions are frequent in occurrence, particularly where untreated domestic sewage also is discharged. This is one of the major problems in highly industrialized and populated centers. Septic conditions have been described in a general manner in the discussion of stream-self-purification, and need no further consideration here. There may be some thought that these conditions occur only when organic matter is discharged but this is not true. Any waste which will consume the dissolved oxygen in surface waters, be it organic or inorganic, if discharged in sufficient quantity, can greatly degrade the surface waters and perhaps cause septic conditions. Indirectly, then, many uses of the waters will be impaired or destroyed, and all but a few life forms will be driven away or will succumb to asphyxiation. Oxygen demand, and the effects of wastes which consume dissolved oxygen, have been discussed rather fully by Phelps[112].

Wastes Which Cause Taste and Odor

The discharge into surface waters of untreated petroleum refinery wastes which contribute or indirectly cause tastes and odors in the surface waters is one of the very important forms of water pollution. It assumes this level of importance because of its close relationship to public health, particularly in domestic water supplies, recreational activities, and fisheries.

It is often quite difficult to distinguish between taste and odor because of the close relationship between the two senses, and although most of the sensations we regard as taste actually are smell, we really do taste certain chemical substances when they enter the mouth. Because it is generally considered that the sense of smell is stronger than the sense of taste[40], however, in further discussion smell only will be considered.

The sensitivity of human beings to odors varies widely[111]. Fischer and Penzoldt in 1886 claimed that a certain mercaptan could be detected at a concentration of 1/23,000,000,000 mg. per cc. More recently this degree of sensitivity was doubted.

The four distinct phases to the matter of odors in surface waters are:

1. Odors contributed to surface waters by various tiny single-celled organisms, or by decomposing animal or vegetable matter.

2. Odors contributed to surface waters by chemical compounds in solution as, for example, in refinery wastes.

3. Odors resulting when substances in solution, as in refinery wastes, combine with chemicals added to surface waters in the course of treatment.

4. Odors contributed to the flesh of aquatic animals (usually fish) which are used as food for human consumption.

Effects of Four Causes

The first of these four phases of the odor problem is one traceable entirely to natural causes, and can be dismissed at once. But the other three phases are matters of concern in the practice of refinery waste treatment and disposal.

Probably the most important odor effect of refinery wastes is that upon the use of surface waters for domestic supply (i.e., for potable use). This use of water takes precedent over all other uses, a position which has been supported by decisions in many courts.

Compounds frequently present in refinery wastes, e.g., mercaptans, disulfides, and so forth, which contribute odor directly to water, can place a heavy load on a water treating plant, and greatly increase the cost of treatment by requiring heavier dosages of activated carbon, clay, or other chemicals used for odor removal. If the odor is very persistent, complete or even reasonably complete removal may be impossible.

Only the so called "rough fish" will stay in waters which carry odors such as those contributed directly by some untreated refinery wastes. Bass, trout, and similar species simply will not remain. Usually, the flesh of the fish that do stay, for example the carp, catfish, and buffalo fish, is so affected that it emits the odor when being cooked, and tastes or smells when eaten. This same condition has been mentioned in the discussion of oily wastes.

Domestic Waters Affected Most

One of the most common effects of certain refinery wastes is to cause odors in domestic supplies when the waters are chlorinated to disinfect them, or to remove other odors. This type of odor is the result of reaction between the chlorine and the phenol-like compounds in the wastes. It is the "medicinal", or "iodoform" odor so often heard of, although very frequently confused with odors resulting from the destruction of organisms, e.g. *synura*[49], and sometimes with the odor of chlorine itself.

Possibly one of the most serious effects of all these odors is that they cause people to leave an unpleasant smelling water supply which has been made as safe as known practices permit, and obtain water from a source which may be

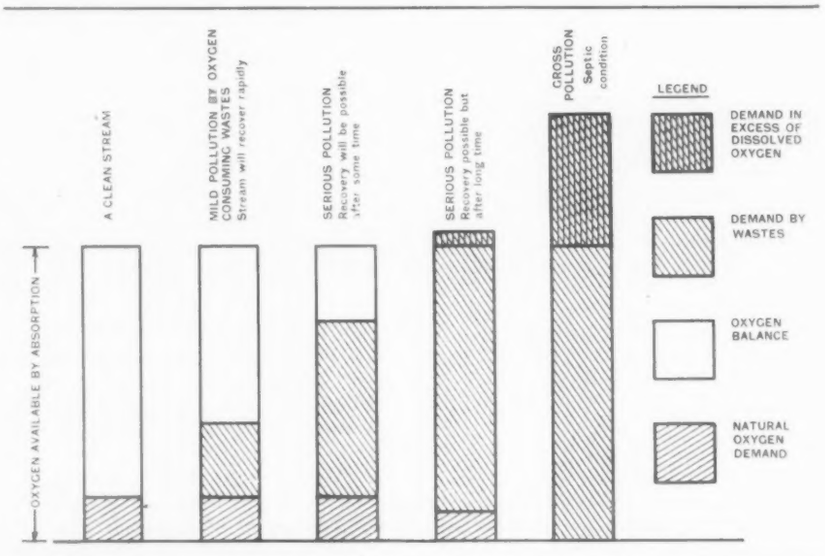
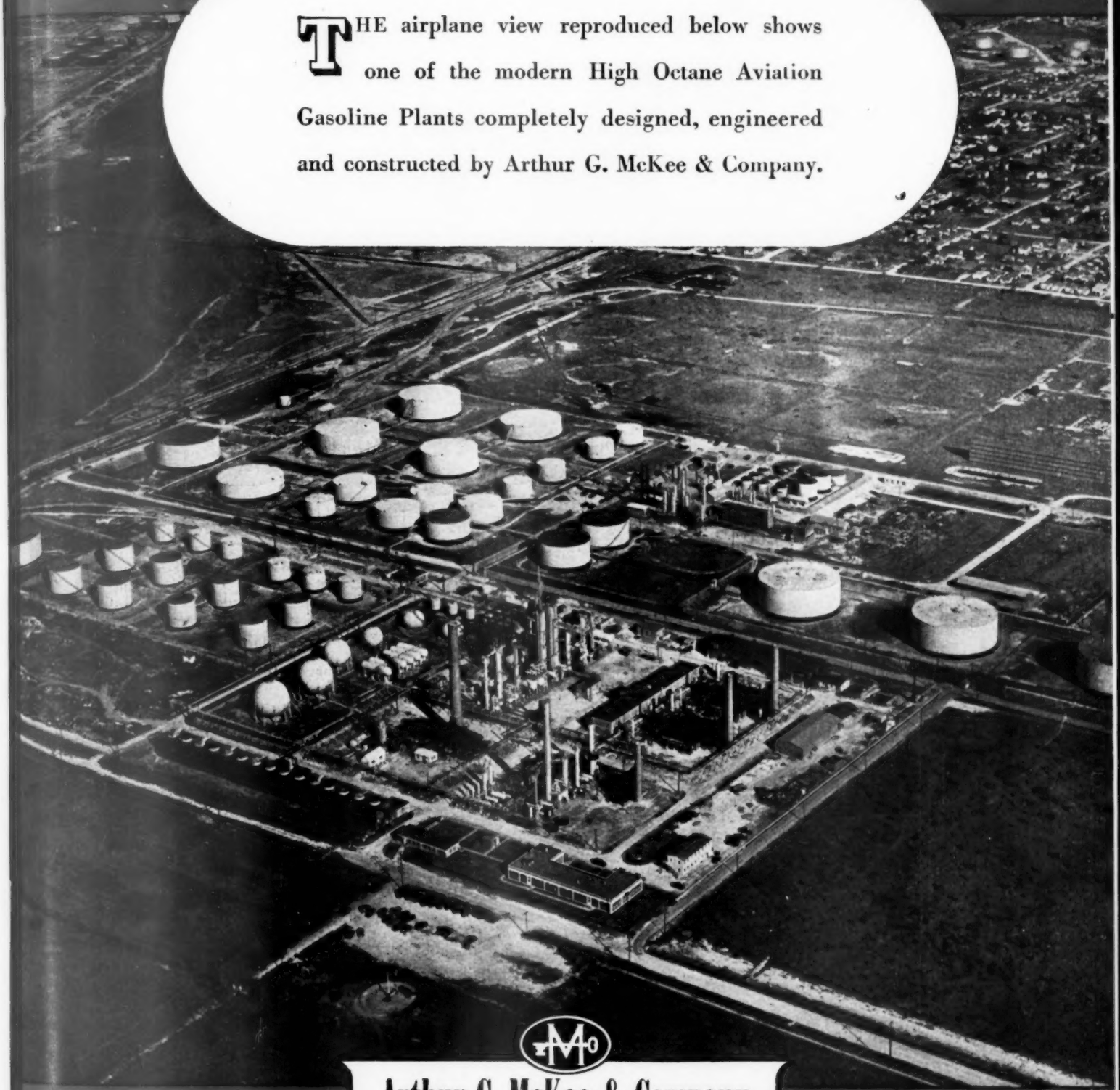


Fig. 1—Graphic summary of the effects on surface waters of oxygen consuming wastes

UNDIVIDED RESPONSIBILITY IN ONE ORGANIZATION

THE airplane view reproduced below shows one of the modern High Octane Aviation Gasoline Plants completely designed, engineered and constructed by Arthur G. McKee & Company.



Arthur G. McKee & Company

★ Engineers and Contractors ★

2300 CHESTER AVENUE • CLEVELAND, OHIO

30 ROCKEFELLER PLAZA, NEW YORK, N. Y. • McCORMICK BUILDING, CHICAGO, ILL.

totally unprotected. Although the water so obtained may be cool, crystal clear, and of good odor and taste, it may also be loaded with the germs of disease. This very practice has been responsible for disease epidemics in the past.

Toxic Wastes

Toxic wastes may be regarded in general as consisting of four groups: (1) the wastes which are lethal because they consume dissolved oxygen and cause death by asphyxiation; (2) the wastes which are corrosively damaging to tissues which they contact and cause death by injuring these tissues; (3) the wastes which are lethal because they dehydrate organisms by osmosis; and (4) the wastes which are truly toxic or poisonous after entering the body through absorption, or through body openings and systems such as the alimentary canal. Oxygen depletion has been discussed under the sub-heading of wastes which absorb dissolved oxygen; corrosive wastes have been considered under the sub-headings acidity and alkalinity; and osmotic effects will be discussed later. The form of toxicity to be considered here is true toxicity which either damages internal tissues or interferes with vital functions.

Probably the most important effect of toxicity is that upon aquatic life, for there have been no instances of actual poisonous effects upon domestic water supplies or recreational uses of water reported in the general literature. All levels of aquatic life are subject to toxic action. Some substances act as bactericides and destroy basteria which are important to water cleanliness. Phenol and phenol-like compounds are in this group. Toxic substances in untreated wastes also penetrate the cell walls of mportant protozoa (microscopic unicelular animals), and in this manner, or otherwise, the animals are destroyed.

Of the larger life forms, fish have been tudied most frequently with respect to he toxicity of various substances present n refinery wastes. Various sulfur compounds are truly toxic. Hydrogen sulfide causes respiratory paralysis. Belding[114], has listed the lethal concentrations of hydrogen sulfide, see Table 1. Methyl

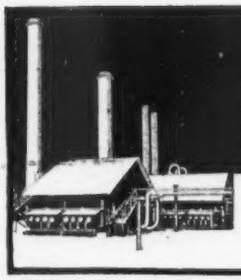
TABLE 1—Lethal Concentrations of Hydrogen Sulfide

Type of Fish	Lethal Concentration
Sunfiish	5.00 p.p.m.
Brook Trout	0.86 p.p.m.
Suckers	3.80 p.p.m.
Goldfish	4.30 p.p.m.
Carp	6.30 p.p.m.

mercaptan is very toxic, and it is claimed that 1 p.p.m. will kill white bass in less than two hours, and perch, black bass, and blue gills in six to eight hours[115].

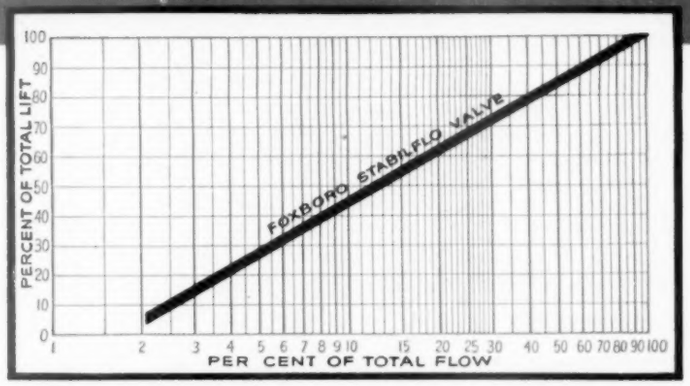
Phenolic compounds are tolerated to some extent by fish but are definitely toxic. Phenol is an irritant. It coagulates mucous secretions, hemolizes the blood (i.e., breaks down the red cor-

A DRAY HORSE AS MOTIVE POWER for a modern trolley is no more futile than attempting to realize your full production potential with an outmoded heater. Today's refinery operation calls for modern heating equipment. Modernizing existing heaters is one Alcorn specialty which has contributed to more efficient production in all types of refinery service. This same engineering skill and experience are at your disposal in helping you solve your heating problems. Consult Alcorn today.



ALCORN
Combustion Company
SCHAFF BUILDING, PHILADELPHIA
Los Angeles • Houston • San Francisco • Tulsa

Only Stabilflo Valves will give you this remarkable performance



50 to 1 RANGEABILITY WITH UNIFORM CHARACTERISTICS

With this unique valve, you now can be sure that the extraordinary sensitivity, accuracy, and dependability of precision-engineered controllers are translated into matching valve performance.

The unique characteristics of the Foxboro Stabilflo Control Valve are graphically revealed in the chart above; . . . *equal increments in controller output (and valve lift) produce equal percentage changes in flow.* Thus under constant pressure drop conditions and on a semi-logarithmic scale, the line plotted is straight.

This achievement was made possible by two major Foxboro developments in valve design. . . .

1 **THE INVERTED TYPE MOTOR** . . . By reversing the usual position of diaphragm and spring, Foxboro engineers practically eliminate all sources of friction in the action of the motor. Anti-friction bearings are unnecessary. The suspended construction of the valve motor requires no guides. A special flexible coupling between the valve stem and the diaphragm motor allows the stem to establish normal alignment.

This self-aligning motor with its floating action is an exclusive feature of Foxboro Stabilflo Valves.

2 **WIDE RANGE V-PORT VALVES** . . . This outstanding development corrects the common faults of control valves of conventional types. Almost any kind of port opening can produce equal percentage flow changes within a limited range, but Foxboro's WIDE RANGE V-PORT VALVE extends the limits to the full stroke of the motor. The greater the rangeability possessed by a valve, the greater its ability to handle unusual conditions. Hence, the 50 to 1 rangeability means that the Stabilflo Valve insures satisfactory control at all demands.

Since the success of any control system may depend as much on the performance of the valve as on the control instrument, it will pay you to investigate the advantages of Stabilflo Valves. Write for complete information. **The Foxboro Company, 56 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities.

FOXBORO®
REG. U. S. PAT. OFF.

AUTOMATIC CONTROL VALVES

puscles), and paralyzes the muscles by its action on the neuromuscular junctions. Its toxicity to fresh-water fish has been reported variously as concentrations ranging from 1 to 10 p.p.m.(116, 117, 118, 119, 120).

Ammonium compounds are highly toxic also, and their toxicity is accentuated by alkalinity in the surface waters. Concentrations ranging from 2 to 13 p.p.m. have been reported as being lethal(111, 114, 116, 121). Other compounds containing nitrogen, such as pyridine, are lethal in similar concentrations.

Salts Act as Acids

Chlorine and chloramines are lethal to some varieties of fish in concentrations of the order of 0.06 to 0.5 p.p.m.(122, 123, 124). Various salts and acids also are toxic. Usually such compounds owe their lethality to their action on external parts, but some are toxic in the true sense. Tannic and chromic acids are example(125). Some acid salts act much like acids. All metallic ions except those of the alkaline earths and alkalies (which penetrate and are truly toxic) coagulate the gill mucus and cause death by asphyxiation. The ions are retained in the coagulated, muscous films(126, 127, 128, 129, 130, 131).

Individual salts vary greatly in toxic action. If two salts are present at the same time their toxic action may be greatly increased, a result known as synergic action, or their toxicity may be reduced, an action designated as antagonism(40, 111). It has been demonstrated, however, that definite ratios of the salts are necessary for antagonism to result, otherwise there may be an opposite effect(132). All such variables, and the relationship between antagonism, hardness, and alkalinity of the surface waters must be established carefully.

The discharge of some substances which themselves are not toxic, or are only mildly so, may result in the formation of much more toxic substances when acted upon chemically or biologically. For example, sodium sulphate under the proper conditions is acted upon by sulfur bacteria and hydrogen sulfide is produced.

Affects Water for Live Stock

Other uses of surface waters which may be affected by toxic substances in refinery wastes are stock watering and agriculture. The water supplied for cattle and other domestic animals to drink rarely is subjected first to purification treatment. Instead, the animals drink from the streams and lakes in their pastures. Toxic substances in these waters may cause the stock to refuse to drink, thereby interfering with their growth development. If the water is consumed, intestinal disorders or even death may follow. Heller(133) has studied the effects of various salts when consumed by cattle.

In general, toxicity is a matter of concentration. Substances which are rapidly lethal in high concentrations may be entirely harmless in low concentrations or traces. This is not always the case, however, for some substances are lethal in even very low concentrations because of cumulative effects. Death may not occur for some time, but will terminate a period during which the organism affected is increasingly weakened. Beyond a certain point recovery will not follow, even though all traces of the toxic substance are eliminated. Cumulative effects of substances often present in refinery wastes have not been investigated extensively, but should be considered carefully in waste treatment and disposal practices.

Wastes Carrying Dissolved Solids

Refinery wastes which contain dissolved solids in excessive concentrations when compared with the usual concentrations in surface waters (see Article 5, May 1, 1946, NPN *Technical Section*, pg. R-371) will affect the surface waters, their uses, and the aquatic life they support. The character of the surface waters will be changed in proportion to the extent their normal dissolved solids are increased. Depending upon the quality of the dissolved solids in the waste, there may be reaction with substances normally present in the surface waters. If calcium or magnesium ions, or both, are present in the waste they will increase the "hardness" of the surface waters.

When changes such as those briefly outlined occur in surface waters, the uses of these waters also are affected. These effects may become pronounced when dissolved solids are present in very high concentrations. The preparation of water for satisfactory domestic supplies will be attended with considerable difficulty, and in extreme cases (where large quantities of the waste are discharged into small streams or lakes) may be impracticable. Use of such waters for boiler supply may result in serious scale formation unless there is extensive pretreatment. Water of this character often cannot be used for industrial processing without treatment specific to the application of the water. Such treatment is usually quite costly. Hardness added to the surface waters will require removal by "softening" treatments, othewise excess costs for soaps or chemicals in domestic and industrial uses of the waters will ensue.

Osmotic Pressure Is Another Effect

One of the outstanding effect of high concentrations of dissolved solids is that upon the animal and plant life of surface waters, which, for the purpose of this discussion, may be explained as follows:

When two solutions containing different concentrations of dissolved solids are separated by a permeable or semi-permeable membrane, there is a flow of the solvent from the solution of lower molecular concentration to the solution of higher concentration. This is osmotic flow, and the pressure which develops as a result of the flow is the osmotic pressure.

In the natural environment of surface waters, the permeable membranes are the cell walls and membranes of the aquatic animals and plants. On one side of these cell walls and membranes are, for example, the blood and body fluids of the fish and on the other side is the aquatic environment in which they live. The solids of the blood and body fluids usually are relatively constant in concentration, although some fish can change this concentration to correspond to their environment and to environmental changes. Most important fresh-water fish do not have this control. Consequently, if the concentration in the life fluids of the fish does not change, there is osmotic flow of water from the fish. Thus they are gradually dehydrated. The protoplasm shrinks away from the cell walls, which then sag, and death soon follows for either animals or plants.

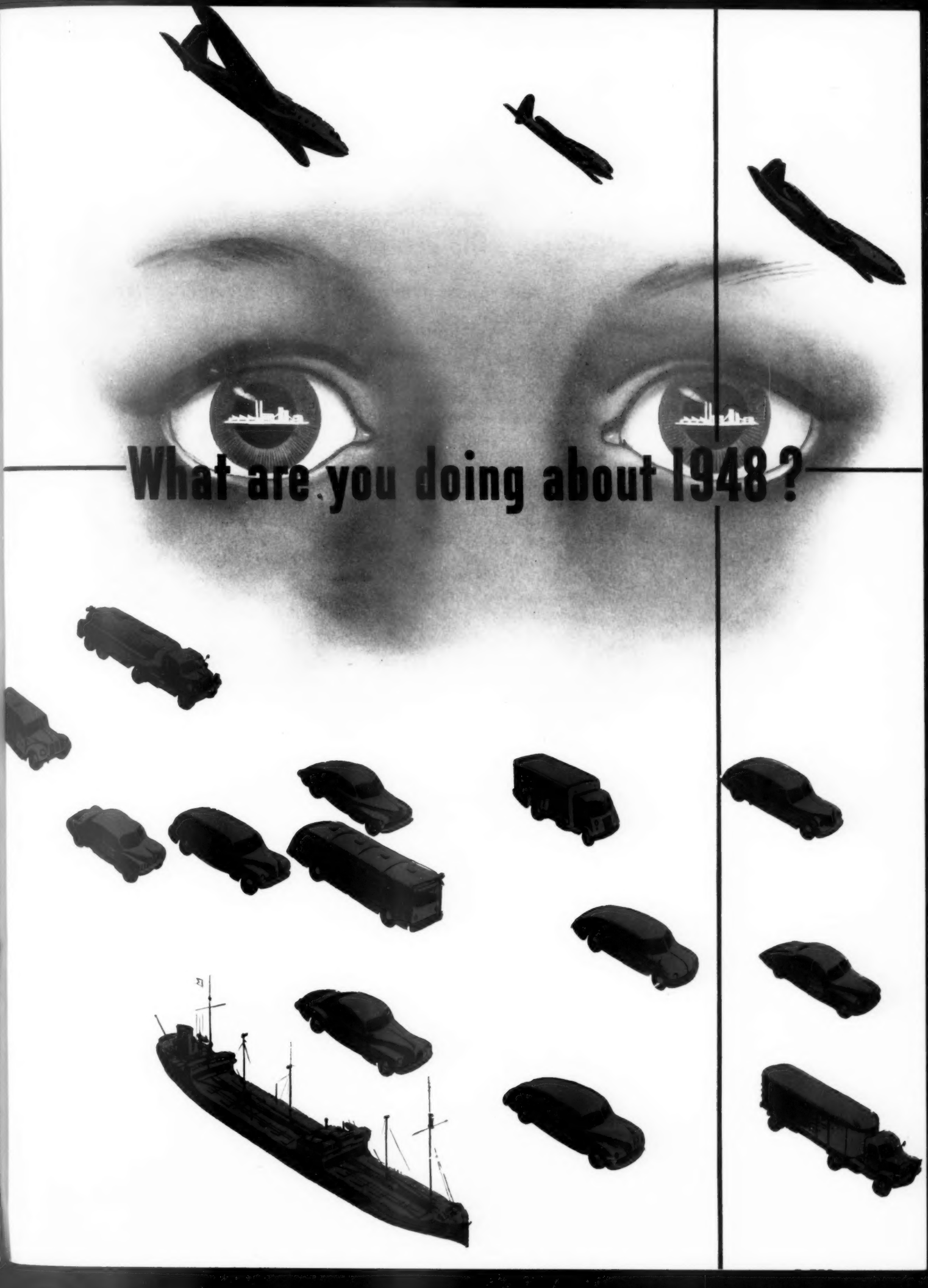
Exceptions To Osmotic Rule

There are exceptions to this rather general statement. Although most living cells are in osmotic equilibrium with their environment, in some fresh-water protozoa, the concentration of salts in the protoplasm is much higher than in the surrounding water. Consequently, water passes into the protoplasm continuously. But such animals have an organ known as the "contractile vacuole" in the cell. This organ pumps out excess water continuously, and thereby prevents undue enlargement of the cell. Animals of this type are not so vulnerable to highly dissolved solids concentration, but they should not be used as a criterion of tolerance.

All the above is a very brief explanation of one of the effects of excessive dissolved solids. It has been discussed in greater detail by Heilbrunn(40). The osmotic effects in general, however, are important effects of untreated refinery wastes upon surface waters. These effects are most pronounced in fresh-waters and often they are overlooked, misunderstood or ignored. Ellis, in discussing their importance, states that concentrations of dissolved solids in excess of about 350 p.p.m. (specific conductivity of 500 Mhos at 25° C.) have been shown by investigation to be the upper limits of the optimum environmental condition for the important fresh-water fish.

Wastes Carrying Suspended Solids

Solids, for the purpose of this discussion, may be regarded as the finely divided particles of matter present in, but not dissolved in, the surface waters, and classed in general as "suspended matter". These particles may or may not settle, depending upon their specific gravity, size and shape, and upon various conditions in the water which carries them.

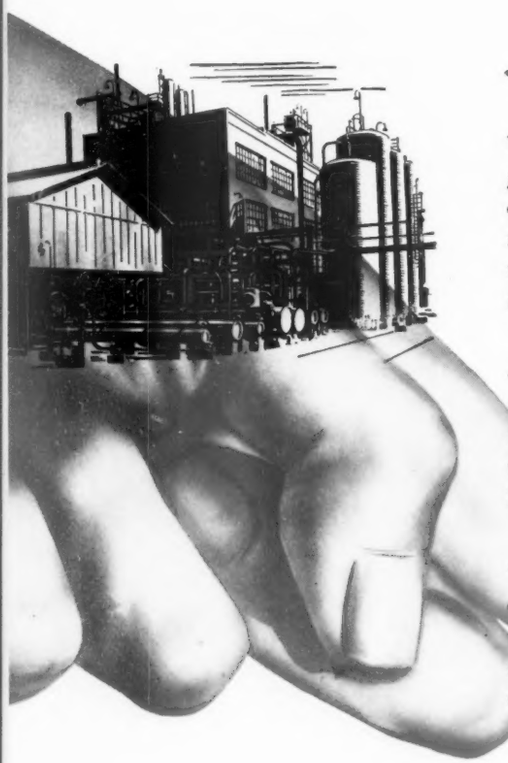

What are you doing about 1948?

LUMMUS WILL HELP YOU PLAN

NEW LUBE OIL PLANTS . . .

. . . to produce maximum yields of high grade lube stocks at minimum cost.

. . . to meet changing marketing conditions.



With the stabilization of industry, rapidly mounting automobile production, growth of air travel and the expansion of industry, there is a swiftly growing demand for high grade lubricating oils. Add to these domestic requirements the near-future needs of European countries and we have a lubricating oil picture that calls for immediate planning and early construction of additional lube oil facilities.

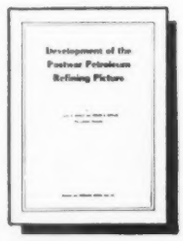
For three major oil companies, Lummus is now building three lube oil plants —eleven units in all—incorporating vacuum distillation, propane deasphalting solvent refining, solvent dewaxing, and clay finishing. These plants will have a total capacity of 7500 barrels of finished oil per day. Incidentally, when completed they will be the 15th, 16th and 17th solvent refining plants and the 20th, 21st and 22nd solvent dewaxing plants designed and built by Lummus.

Lummus engineers are available for a thorough study of individual problems. They are ready to project processes through laboratory and semi-commercial operation, and equipped to determine construction and operating costs for a thorough consideration of the economics of each proposal. Lummus Laboratories and pilot plants have every facility for lube oil evaluation, including propane deasphalting, solvent refining, solvent dewaxing and clay finishing.

Are you interested in modern, *low-cost* lubricating oil plants?

THE LUMMUS COMPANY

420 Lexington Avenue, New York 17, N. Y.
600 South Michigan Avenue, Chicago 5, Ill. — Mellie Esperson Bldg., Houston 2, Texas
634 South Spring Street, Los Angeles 14, Calif. — 78 Mount Street, London, W. 1, England



Write for a copy of "Development of the Postwar Petroleum Refining Picture," an interesting analysis and prediction of postwar refining and marketing developments.

Lummus
PETROLEUM REFINING PLANTS

If they do settle under certain prescribed conditions they are known sometimes as "settleable solids". If they are so small that they settle only after a very long period of time, or not at all, they are classed as true turbidity. There is no closely defined line of demarkation between "suspended matter", "settleable solids", and "turbidity", although there is a wide difference between the extremes of this series of conditions.

This description applies generally to the solids naturally present in surface waters. It applies also to solids frequently present in refinery wastes and waste waters. Such solids usually consist of carbon (as coke), fine clay, catalyst, silt, and cinders, and they often are introduced into refinery waste waters by the run-off flows following storms. In some refinery wastes floc-like particles are present, in others stable emulsions of the oil-in-water type cause pronounced turbidity.

Stokes Law Applied

As has been said previously, some of the suspended matter will settle and some, because it is so finely divided as to be almost colloidal, will remain in suspension even under the quiescent conditions of lakes, and will cause turbidity. The suspended matter varies in quantity, quality, and shape. In lakes, that which is present naturally may consist of silt, plankton organisms, and organic matter. To this will be added the suspended matter from any untreated refinery waste which is discharged.

Of those various particles which will settle, the larger ones of reasonably round contour will fall rapidly, the smaller ones more slowly. The smallest will settle at a rate which is predictable by using Stokes' law, expressed as follows:

$$V = [2G\,(S - S')\,R^2]/9\,\upsilon$$

where:

V = velocity of the settling particle,
G = acceleration of gravity (32.16 ft./sec., or 980 dynes),
S = specific gravity of the particle,
S' = specific gravity of the water
R = Radius of the particle
υ = Kinematic viscosity of water.

For particles of irregular shape, comparable to plankton forms, Ostwald[134] proposed the following equation:

$$\text{(Sinking velocity)} = \frac{\text{(Excess Weight)}}{\text{(Viscosity of Water)} \times \text{(Form Resistance)}}$$

in which

Excess Weight = The difference between the specific gravity of the particle and that of water.

Form Resistance = The surface area and shape of particle.

Stever[135] shows how this formula can be applied, but it should be understood that precise rates of settling for particles, even in still water, cannot be calculated because of variations in shape, size, and gravity. Whipple presents a tabulation of the rate of settling for various substances from which approximations can be made for other particles similar in nature.

In flowing waters (i.e., rivers) another factor is involved. This is the velocity of the flow. The carrying power of flowing water is said to vary as the sixth power of the velocity. With this in mind, it will be obvious that run-off water from storms, flowing at high velocities, will carry heavy loads of suspended matter which will settle as the rate of flow subsides. But in rivers the settling is much slower than in lakes, and if there is a great mass of the very fine particles, as in the Mississippi River, there will be constant high turbidity.

Suspended matter and turbidity affect many of the uses of surface waters and practically all forms of aquatic life. Finely divided rock, coke, coal, cinder, and so forth cause serious erosion of pumps and lines. They sometimes settle in the lines and cause blockages or at least losses in line carrying capacity. In water purification plants suspended matter and turbidity add to the expense of sedimentation, flocculation, and filtering procedures. Expensive treatment may be necessary before the surface waters can be used for many industrial purposes. Navigation is affected when solids settle into channels, and costly dredging is required. Recreational uses of waters are affected by the so-called "dirtiness" of the water, and bathing, boating and fishing are interfered with seriously. Farm stock often refuse to drink water which is turbid and laden with suspended solids, although this may be due to other causes to some extent. Uses of such waters for irrigational purposes may be affected, depending upon the nature of the suspension.

Suspended Matter Destructive

Biologically, the effects of suspended matter and turbidity are very serious, and often are either not recognized or are ignored. The effects are caused principally by the settling of the suspended matter, and by the reduction of light penetration into the waters. In this effect, both suspended matter and turbidity are involved.

When suspended matter settles, its first effect is to tear loose and drag down life forms and eggs attached to, or supported by aquatic vegetation. Many such forms are a part of the food supply of larger aquatic animals. Others are organisms which are important to stream cleanliness. Frequently the vegetation itself is overwhelmed and becomes a part of the organic load which must be oxidized by the stream in order to maintain its cleanliness. In this way the suspended solids are related to the dissolved oxygen content of the surface waters. The organic matter is carried to the bottom where it forms a sludge-like layer in which bacteria are active, but even this condition may be overwhelmed by heavy loads of solids which have settled. Bottom living forms, important as food for other aquatic life, as well as the nests of bottom-nesting species of fish, are covered over and destroyed.

In fact, the usefulness of surface waters may be almost completely destroyed by wastes heavily laden with suspended, but settleable, solids. If the surface water is a river it may even become a flood menace. If the solids fill the stream channel, the carrying capacity of the river bed will be reduced greatly. Then, when the floods come, the stream goes over its banks and flood damage follows.

Solids Cut Out Light

Both settleable solids while yet in suspension and true turbidity interfere with the penetration of light into surface water. One of the reasons why the waters are a favorable environment is that they transmit light readily. Light is essential to the processes of photosynthesis by which green plants convert carbon dioxide and water into carbohydrate. The process is of tremendous importance for all life. In the ultimate analysis, even those animals which consume other animals are dependent upon the vegetable matter which these other animals consume, and it is by photosynthesis that the vegetable matter has gathered the energy derived from the sun, the source of all energy. It has been said that the wealth of the world has always depended and depends today upon photosynthesis, for this natural process is responsible for the origin of coal, oil, lumber, and farm products.

Only the green plants are capable of photosynthesis, for they contain chlorophyll which is essential to the process. Certain bacteria (the autotrophic forms) which lack chlorophyll are capable of photosynthesis, but do not generate oxygen.

Because it excludes light, turbidity interferes with this highly important process of photosynthesis. The interference is pronounced, for excessive turbidity may exclude the light from any but the upper few inches or less of the water. Several refinery wastes are capable of producing turbidity to this extent if discharged in quantity into bodies of water of low volume.

Colored Wastes

Color, as used here, refers to the true color of the wastes or surface waters in question. It is caused by colloidal substances or by substances in solution. In contrast, apparent color results from various causes such as turbidity and substances in suspension.

Surface waters vary widely in color from those which are practically colorless to the deep brown waters of bogs and swamps. In Wisconsin, 530 lakes studied by Juday and Birge[136] ranged in color from 0 to 340 on the platinum-cobalt standard[137]. The running water series varies just as widely, but has not been studied as carefully, and it is probable that suspended matter, which causes an apparent color, is more important.

Colors in surface waters are caused by iron as ferrous sulfate or oxide, which imports various yellowish to reddish yellow shades; by calcium carbonate, which

when present in sufficient quantities is claimed to cause a greenish color; and by humus from peat bogs, which is said to produce bluish shades in low concentrations, and shades which vary through green, yellowish brown, to deep brown as the concentration increases. Manganese also causes color, as do many naturally occurring organic substances. There is considerable controversy over the causes of color in surface waters, as related to the colors which result[47].

Absorption Selective

The effect of color on surface waters is to interfere with the penetration of light. When light enters pure water (i.e., chemically pure), some of the light is absorbed and some is scattered in all directions by deflection. Absorption is selective, the vibrations at the violet end of the spectrum being affected the least, and those at the red end the most. The vibrations at both ends, however, are absorbed quickly. Welch,[47] in his studies of the natural waters of lakes, states that through heavily stained waters very little radiation of wave-lengths less than 6000 angstrom units[36] penetrates more than about one meter; penetration of blue is neglibible; and the amount of green light is very small and disappears rapidly as depth increases. Red light probably will exceed any other color in penetration and may be greater than all others. This is because red light, which is affected quickly in pure water, is least affected by stains and colors.

When wastes which cause color are discharge into surface waters, several uses of the waters are affected. Its utility as a source for domestic supply may be involved, for color in purified water is an important item. The effect of color on consumers has been evaluated by Whipple[49] as:

$$P_c = 0.5C$$

in which

P_c = The percentage of people who object, and,

C = the color on the Standard Methods Scale[137].

This equation plots as a straight line and shows clearly the effect of color which passes through the water purification process. Coloring matter which acts as an indicator, i.e., changes color with change in reaction, is particularly objectionable.

Color, since it interferes with light penetration, also may adversely affect photosynthesis, which has been considered in the discussion of suspended matter and turbidity.

The environmental conditions of aquatic plants and animals are changed when color is introduced, and even though no toxicity is involved, and no oxygen is depleted, some animal forms may be driven away and the ecological balance upset.

Minor Miscellaneous Wastes

Since these wastes may affect the surface waters in any one of the several ways already discussed, and since they are the result of special processing usually, they cannot be discussed further here. They will be considered at appropriate times later.

Temperature

Although not separately listed in the tabulation of the various types of petroleum refinery wastes, temperature plays such an important role in some phases of the effects of wastes that it cannot be overlooked.

In many industries large quantities of water are used for cooling purposes, and changes of a very few degrees of temperature of the supply is of economic importance. Such an increase in temperature can result readily if excessively warm wastes are discharged. Yet, it is not uncommon to find the water intake of a plant downstream from a hot discharge which is not arranged to provide good mixing, and which permits short circuiting almost directly to the intake.

The greatest effect of temperature, however, is probably the effect upon aquatic life. The upper and lower temperature ranges of life forms have been mentioned (Article 6, June 5, 1946, NPN *Technical Section*, pg. R-467). Temperature also influences physiological processes. An increase in temperature causes an increase in metabolic processes such as respiration, circulation, and so forth. For each rise of 1° C. in temperature there is an increase of about 10% in metabolic rates. According to Van't Hoff[40], metabolic rates increase from 200 to 300% for each rise of 10° C. This means that for a 10° C. rise, toxicity of a substance may be from 2 to 3 times as great, oxygen consumption is increased greatly, and all processes are speeded up. The effects of these factors are obvious from foregoing discussions.

With these discussions the ground work for good practice in the treatment and disposal of refinery wastes has been completed. This groundwork has been brief, for many factors have not been touched upon. Where necessary these factors will be discussed in connection with specific procedures.

The articles which follow will discuss waste treatment in its practical applications. One of the most important, the organization for handling wastes, and another, of equal importance attacking a waste treatment and disposal problem, will be discussed in the next article in the September issue.

References

(112) "Stream Sanitation", Earl B. Phelps, New York, 276 pp., (1944).

(113) "Smell, Taste, and Allied Senses in the Vertebrates", Parker, Philadelphia (1922).

(114) "Toxicity Experiments with Fish in Reference to Trade Waste Pollution", D. L. Belding, *Trans. Amer. Fish Soc.*, 57:100-119 (1927).

(115) "The Toxicity of Methyl Mercaptan for Fresh-Water Fish", Cole, *Jour. Pharmacol and Expt. Therapeut.*, 54:448-453 (1935).

(116) "An Experimental Study of the Effects of Gas Waste Upon Fishes with Especial Reference to Stream Pollution", V. E. Shelford, Ill. State Lab. Nat. Hist., Bull. 11:381-412 (1917).

(117) "Poisoning of Fish by Waste Waters from Chemical Factories", V. Demyanenko, *Hig. i. Epidem.* (U.S.S.R.), 10, No. 6/7, 13 (1931).

(118) "Phenolic Wastes," E. F. Eldridge, Mich. Eng. Expt. Sta., Bull. 60:49-60 (1934).

(119) "Empyreumatic Products in Waste Waters", A. Gregoire, *Chimie et Industrie*, Spec. nr., 843-844 (1931). "The Biological Detoxification of Waters Containing Phenol and Its Significance in Estimating Damage to Fisheries", H. Hardtl, *Prager Tierarzt-Liches Arch.* (1935).

(120) "Road Tars and Fish Life", Joint Comm. on Damage to Fisheries, *Surveyor*, 78: 625-626 (1930).

(121) "Studies of Fish Life and Water Pollution", H. W. Clark and G. O. Adams, Mass. State Bd. of Health, 6:336-345 (1913).

(122) "Treatment for Removal of Chlorine from City Water for Use in Aquaria", R. S. Taylor and M. C. James, *U. S. Comm. Fish and Fisheries*, Rept. App., 7:322-327 (1928).

(123) "Free Active Chlorine in Water and Its Action on Fish and Other Aquatic Animals", G. Ebeling and T. Schrader, *Ztschr. F. Fischerie U. D. Hilfswissen-Schaften*, Ten., 29:53 (1929).

(124) "The Conditioning of a Chlorine Treated Water Supply for Biological Purposes", F. L. Coventry, V. E. Shelford and L. F. Miller, *Ecology*, 16:60-66 (1935).

(125) "Comparative Toxicity of Various Acids for Fish", Guelyard and Duval, *Compt. Rend.*, 175:1243-1245 (1922).

(126) "The Biological Factors Involved in the Destruction of River Fisheries by Pollution Due to Lead Mining", K. E. Carpenter, *Ann. Applied Biol.*, 12:1-13 (1925).

(127) "The Lethal Action of Soluble Metallic Salts on Fishes", K. E. Carpenter, *Brit. Jour. Expt. Biol.*, 4:378-390 (1927).

(128) "Further Researches on the Action of Metallic Salts on Fishes", K. E. Carpenter, *Jour. Expt. Zool.*, 56:407-422 (1930).

(129) "Zur. Pharmakologie Des Bleis; Uber Den Mechanismus Der Bleivergiftung Von Fischen", B. Behrens, *Arch. F. Expt. Path. U. Parmokol.*, 137:311-314 (1928).

(130) "The Relation Between the Electrolytic Solution Pressures of the Metals and Their Toxicity to the Stickleback" (*Gasterostaur Aculeatus L.*), J. R. E. Jones, *Jour. Expt. Biol.*, 16:425-437 (1939).

(131) "Experiments on the Effects of Lead on the Growth of Plaice", W. J. Dilling, C. W. Healey and W. E. Smith, *Ann. App. Biol.*, 13:168-176 (1926).

(132) "Antagonism and Its Utility in Polluted Waters", E. B. Powers, *Trans. Amer. Fish Soc.*, 50:293-296 (1920).

(133) "The Effect of Saline and Alkaline Waters on Domestic Animals", V. G. Heller, Oklahoma Agri. and Mech. Coll. Agri. Exper. Sta. Bull., No. 217 (1933).

(134) "Zur the Theorie Des Planktons," W. Ostwald, *Biol. Zentralbl.*, 22:596-605, 609-638 (1902).

(135) "Planktonkunde", Stever, Leipzig (1910).

(136) "The Transparency, The Color, and The Specific Conductance of The Lake Waters of Northeastern Wisconsin", C. Juday and E. A. Birge, *Trans. Wis. Acad. Sci., Arts and Let.*, 28:205-259 (1932).

(137) "Standard Methods of Water Analysis", 8th Ed., Amer. Pub. Health Assoc., New York (1937).

are you good for 20° below next winter?

Be sure! Know that your oils will remain fluid. Improve your cold weather motor oil sales. Use PARAFLOW...a PARAMIN product.

PARAMINS* make good motor oils better!

ADDITIVES WITH A BACKGROUND

PARAMINS INCLUDE:

PARATONE —*for improved viscosity index.*
PARAFLOW —*for lower stable pour.*
PARATAC —*for tacky oils and greases.*
PARAPOID —*for E.P. gear oils.*
PARANOX —*for inhibiting corrosion and oxidation.*
PARASHEEN—*for better appearance.*
PARADYNE —*for improved gasoline.*

*Trade Mark

Distributed by: Stanco Distributors, Inc., 26 Broadway, New York 4, N. Y.; Stanco Distributors, Inc., 221 North La Salle St., Chicago 1, Ill.; The Carter Oil Co., P. O. Box 801, Tulsa, Okla.; Griffin Chemical Co., Los Angeles and San Francisco, Calif.; Imperial Oil Ltd., 56 Church St., Toronto 1, Canada

Germany Made Acetylene and Carbon Black By Cracking Natural Gas in Electric Arc

By E. S. Pettyjohn

Director, Institute of Gas Technology

Complete details are given of the process developed by the Germans for manufacturing acetylene and carbon black by the thermal cracking of natural gas in an electric arc, using direct current at 7000 volts. The installation described had 15 units, each consisting of two converters, one in service and one in reserve, and individual rectifying system with voltage booster and power factor control.

The cracking took place at high temperatures and normal pressures, with rapid quenching to retard polymerization of the low molecular weight hydrocarbons. Mean gas temperature for conversion was 1600° C. After cooling by water spray, the gas passed through a trap and cyclone separators to remove the carbon black, and was then water washed, scrubbed with absorption oil, desulfurized and purified. The acetylene was converted by a four-stage process to butadiene for synthetic rubber manufacture.

While the Germans seem to have successfully solved the technical details of electric arc cracking of natural gas to produce carbon black and acetylene, the wartime conditions under which the plant was operated prevent an economic evaluation of the process in competition with practice in this country.

WHEN intelligence teams from the U. S. and other Allied nations in the spring and early summer of 1945 were moving through middle and western Germany inspecting industrial plants and research laboratories, it was not anticipated that natural gas was being used as a raw material in chemical synthesis. This use was discovered in the inspection of the Chemischwerke at Huls, owned jointly by the I. G. Farbenindustrie and Bergwerkesellschaft A. G. Huls is a little village near Marl in Recklinghausen, about 10 miles north of Essen and well removed from the heavy industry area in the Ruhr.

The plant was designed to use coke oven gas from a by-product coke plant in the area and was operated in 1940 with a rated capacity of some 30,000 metric tons of total product. As the war progressed, operations were curtailed and shifted first to the use of waste hydrocarbon gases from the Gelsenkirchen synthetic oil plant and finally, as the result of strategic bombing, to natural gas from the small field near the Dutch border at Bentheim. With the limited natural gas available from this field, only 10 of the units could be operated continuously on a total feed of 24,000 MCF per day.

The plant was unique in that it was designed to make acetylene by the thermal cracking of hydrocarbon gases in an electric arc and to convert this acetylene to ethylene and ethylene derivatives by hydrogenation, and to butadiene by the four-stage process. Substantial quantities of these end products, namely ethylene and ethylene derivatives and butadiene, were subsequently used in a slow polymerization process for the synthesis of aviation engine lubricants and for the production of synthetic rubber.

The process at Huls consisted of the high temperature, normal pressure of natural gas in an electric arc with rapid quenching to retard polymerization of the low molecular weight hydrocarbons formed, the removal of two useful grades of carbon black and the subsequent absorption of the acetylene produced by scrubbing with water at 18 atm. pressure. Hydrogen and ethylene were also recovered from the arc gas by low temperature fractionation and the residual gas recycled to the arc.

Arc Converters

The arc converters were by far the most novel and interesting part of the plant as they were believed to be the first successful commercial units employed for cracking natural gas to acetylene. The plant contained 15 units, a unit having two converters, one in service and one in reserve.

Each unit included an individual rectifying system with voltage booster and power factor control. Fourteen of these systems were two-stage mercury vapor rectifiers operating in series receiving three-phase AC at 6000 volts and rectifying from a 12-phase secondary, each stage giving 1000 amperes at 3500 volts DC. The wiring diagram is shown in Fig. 1.

The converters consisted of a distributing head supporting a porcelain-insulated copper electrode, a "flame" tube partially supported on a steel expansion joint and grounded to the supporting steel structure and a lighting rod. The upper and lower plates, the housing, the tangen-

Acknowledgement

The accompanying article is the principal portion of a paper presented before the meeting of the Natural Gas Department, American Gas Assn., Cincinnati, May 7-8, 1946, under the title, "German Use of Natural Gas." The material in the paper was taken from the reports of the Synthetic Fuels and Lubricants Team of the U. S. Naval Technical Mission in Europe ("The Arc Process for Acetylene Production," Technical Report No. 115-45, by Ensign G. M. Morrow, U.S.N.R.), and from notes made by the author during the interrogation of Dr. Baumann, chief chemist at the Huls plant.

Earlier articles on the German process for acetylene production appeared in the NPN *Technical Section*, Nov. 7, 1945; "Arc Cracking of Gases Yields Acetylene for Butadiene in Huls Rubber Plant", pg. R-865, and Acetylene Production by Electric Arc Cracking and Its Purification", pg. R-866.

Capt. E. S. Pettyjohn, U.S.N.R., now Director of the Institute of Gas Technology, Chicago, was a member of the U. S. Naval Technical Mission in Europe.

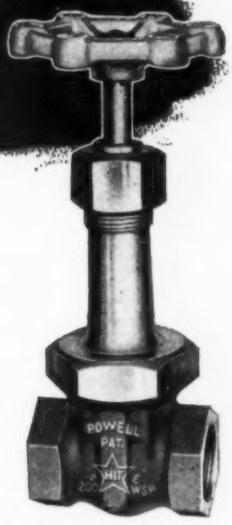
Capt. Pettyjohn

Let POWELL guide your way to assured, unfailing flow control

Through the ages, men on land and sea have been guided to their destination by the *North Star*. It is easy to find because it is almost in line with the two stars on the right end of the "Big Dipper."

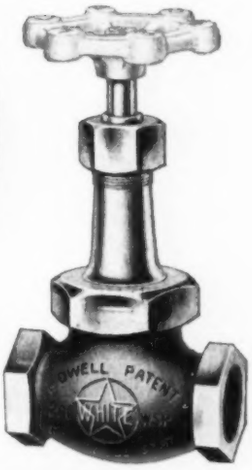
Many years ago Powell patented the famous "Star" Regrinding Globe Valve. Today, the *Powell Star*, backed by 100 years of accumulated technical knowledge and manufacturing skills, is serving Industry as a guide to assured, unfailing flow control. The Complete Powell Line includes valves for every known industrial service and as new demands arise Powell Engineers will design valves to meet them.

Catalogs gladly furnished on request. Kindly specify whether you are interested in Bronze, Iron, Cast Steel, or Corrosion Resistant Valves.

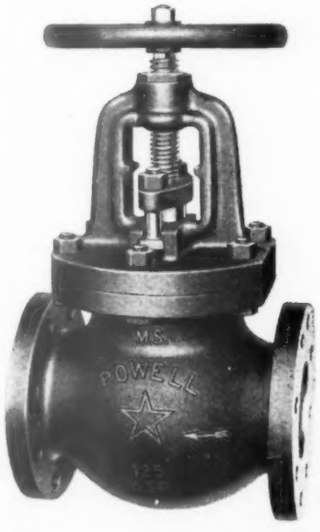


200-pound Bronze "White Star" Gate Valve with inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze disc.

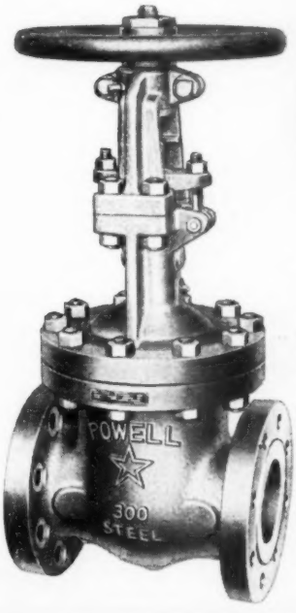
Large Iron Body Bronze Mounted Gate Valve for 125 pounds W. S. P. Sizes 2" to 30", incl. Has outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Also available in All Iron for certain services.



200-pound Bronze "White Star" Globe Valve with union bonnet, renewable, stainless steel seat and regrindable, renewable wear-resisting "Powellium" nickel-bronze disc.



Large Iron Body Bronze Mounted Globe Valve for 125 pounds W. S. P. Sizes 2" to 16", incl. Has outside screw rising stem, bolted flanged yoke, and regrindable, renewable bronze seat and disc. Also available in All Iron.



Class 300-pound Cast Steel Gate Valve with bolted flanged yoke, outside screw rising stem and taper wedge solid disc. Powell Cast Steel Valves of all types are available in pressure classes from 150 to 2500 pounds, inclusive.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

tially slotted distributor shield and the "flame" tube sleeve were low carbon steel, cast and machined. The "flame" tube water jacket and the bellows expansion joint were rolled steel. The copper electrode and the area adjacent to the "flame" tube in the lower distributor plate were water cooled. The "flame" tube was about 95 mm. inside diameter by 1 meter in length. The details of the converter are shown in Fig. 2.

The converter was placed in operation by first purging with inert gas, adjusting the cooling water to the electrode (8-10 m^3/hr.) and the flame tube jacket (8-10 m^3/hr.), turning on the spray or quenching water (about 4½ m^3/hr.) and then admitting the gas mixture to be cracked at about 1200 m^3/hr. The converter was then lighted by raising the lighting rod into contact with the electrode creating a short-circuit. The flow of current was quickly raised to 850 amperes, the lighting rod separated and lowered and the arc drawn. The gas entering the distributor head thru the tangential connection was given an added swirl in passing thru the diagonal slots in the shield above the flame tube and partially cracked. The swirling gas and finely divided carbon were then swept down the flame tube in a helical spiral and provided the temperature and continuity to carry the arc to the grounded lower flange.

With the arc established, the gas flow was raised to about 2800 m^3/hr. maintaining the current flow at 850 amperes, the voltage at 8.4 kv. and the power factor at 0.72-0.75, giving a DC input of 7000 to 7400 kw. Under these conditions, the arc flame extended the full length of the tube and the maximum conversion to acetylene was obtained. With higher power factors the arc went out; with lower power factors the conversion was lower.

Under the above conditions the mean gas temperature was estimated to be 1600° C., although lower temperatures, about 1300° C., were considered more desirable. Arc ignition could not be maintained at the lower temperature so that the higher temperature was accepted with a flame tube life of 250-300 hr. The tube was rejected when the internal diameter had grown beyond a satisfactory operating diameter or had developed local hot spots. The remainder of the converter had shown no deterioration in four years.

The converter was shut down by shutting off the flow of current, purging with inert gas, and shutting off the water cooling and spray. The flame tube was replaced by removing the bolts at the ends of the tube, compressing the bellows expansion joint and sliding the tube from between the flanges.

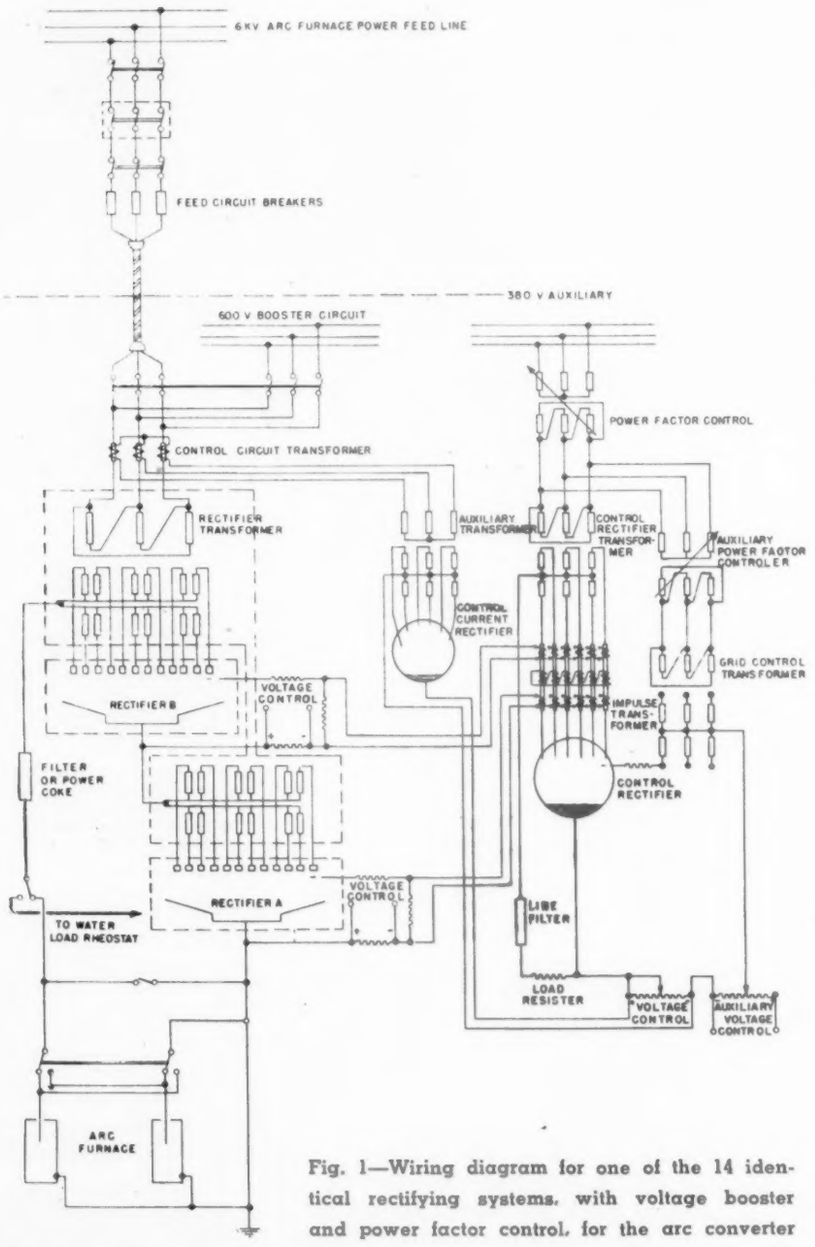


Fig. 1—Wiring diagram for one of the 14 identical rectifying systems, with voltage booster and power factor control, for the arc converter

Carbon Black Separation

The gas leaving the arc converters was cooled by direct contact with a water spray to 130 to 150° C. This cooling required 4½ cu. m. of water per hour. The cooled gas with the entrained carbon black passed downward through a trap where most of the water and a part of the heavy carbon were separated. The gas then passed through two cyclones in series where the remainder of the heavy black was separated. The carbon black from the trap and from the cyclones was segregated from the light carbon black in subsequent handling. The partially cooled gas was then water washed and cooled to 30 to 40° C. The water wash was accomplished in a spray tower, 14 m. diameter by 8½ m. high in five stages; 10 to 20% of total carbon black was recovered from this wash.

The gas was then carried through a series of eight bag filters of 15 bags each. The bag filters were heated indirectly to avoid condensation. The bags in use were made of artificial silk and had a service life of approximately 500 hr. The gas from the several units was then collected in a single main and cooled by direct washing in two spray towers, 3 m. in diameter by 10 m. high, to 20 to 25° C. These towers were operated in parallel. Any carbon black passing through the bag filters was removed in this washing and accumulated in settling basins.

The carbon black, as recovered, was treated in two separate plants and the product designated at T-black and N-black.

T-Black (Dry Carbon Black)

The carbon black separated in the cyclones after the arc furnace was conveyed by a screw conveyor and bucket elevators to bunkers and then pneumatic-

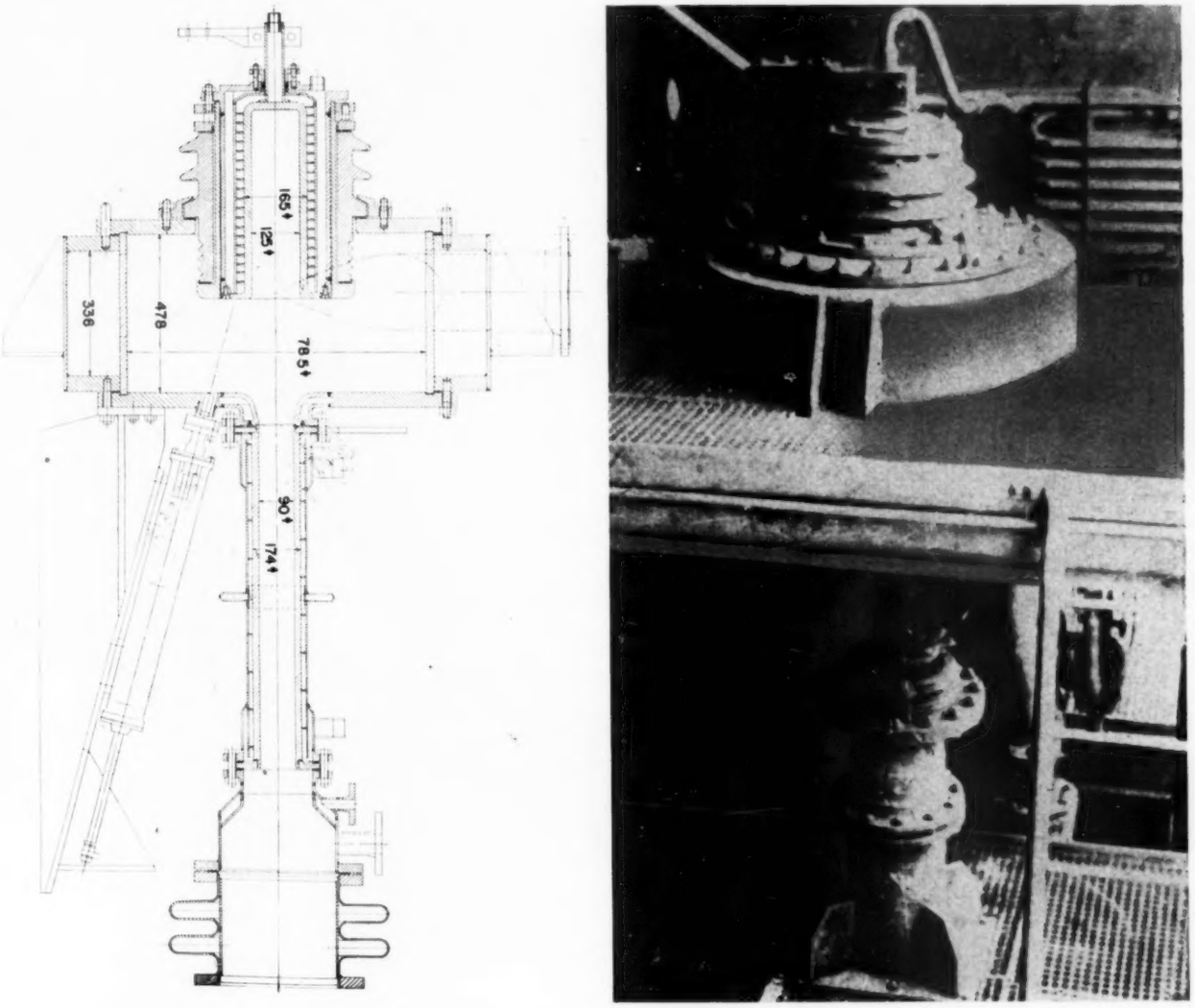


Fig. 2—Cross section and full view of arc converter. These two views are reproduced from original German documents. The dimensions shown are in millimeters and the drawing is not to scale

ally to the treating house. The pneumatic conveyors were discharged into one or two bunkers equipped with air separators. The separated black was screened to remove oversize material and then tumbled in horizontal tumblers, 4.4 m. in length and 8 m. in diameter, with water cooled rolls at 23 r.p.m. This procedure increased the density from 50 grams/liter to 150 grams/liter. The finished black was packed in paper bags and the grit or oversize blown over to the boiling house for underfiring. The recovery of T-carbon black amounted to from 40 to 45 tons per month per converter when using hydrogenation gas and to 20 tons per month per converter when using natural gas.

N-Black (Wet Carbon Black)

The black recovered in the gas coolers after the cyclones and in the bag filters was mixed with the slurry from the secondary washers and settling basins. There were three of these basins, each 15 m. in diameter by 2½ m. deep with approximately 450 cu. m. capacity. The underflow from these basins was pumped over vacuum filters, of which there were 5, each 15 m. in diameter by 10 m. in length, operating at 1/3 r.p.m. The cake from the filter was dried on one of two low pressure steam plate driers to a residual moisture of 1%. The black was then bagged. Its dried weight was 130 grams/liter and the quantity 10 to 20 tons per month per converter for hydrogenation gas or 10 to 12 tons per month per converter for natural gas. The two blacks were somewhat similar in type except for the ratio of yield and extractable organic content. This differentiation is shown in Table 1. The blacks produced in this plant were used in synthetic rubber production, the finer black going into automotive and aviation rubber and the coarse black into domestic rubber.

Low-Pressure Gas Purification

The gas, after leaving the spray washers, was scrubbed with high molecular weight, paraffinic absorption oil in one of four, 11-stage Field type washers. The feed to the washers was such that the fresh oil (about 1 m³/hr.) scrubbed the exit gas in the upper three stages and recirculating oil (about 10 m³/hr.) was admitted to No. 8 stage and scrubbed the gases in the lower or inlet stages of the washer. In the washing, the higher boiling components of the arc gas, both aliphatic and aromatic, were removed. The oil leaving the

TABLE 1—Organic Content and Yield Ratio of Carbon Black

Feed Gas	Extractable Organic Content		Yield, % Total	
	T-Black	N-Black	T-Black	N-Black
Hydrogenation	3-5%	14-18%	70%	30%
Natural Gas	2-4%	9-11%	60%	40%

The biggest mistakes are often made at the start

The biggest mistakes are often made at the start

A small point, overlooked or insufficiently considered at the start of a project, can accumulate a lot of trouble. In process engineering and plant designing especially, it is often extremely difficult, time-consuming —*and costly*—to correct mistakes after construction is under way. . . . We sincerely believe that the assistance of Badger's staff—composed of experts with long experience in process design, mechanical engineering, procurement and erection—constitutes valuable insurance in avoiding at the start pitfalls which beset the path of concerns undertaking the installation of a new process or the building of a new plant.

E. B. Badger & SONS CO. Established 1841
BOSTON 14 • New York • San Francisco • London

PROCESS ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM, PETRO-CHEMICAL AND CHEMICAL INDUSTRIES

LICENSING AGENTS FOR THE TCC PROCESS AND THE HOUDRY CATALYTIC CRACKING PROCESSES

washers was first degassed under 600 mm. vacuum; then 30% of the total quantity (about 6 to 8 m^3/hr.) was given a steam treatment in a flash pan, followed finally by distillation. For the degassing, 3 towers were available filled with Raschig rings, each with 4 trays, 3 m. in diameter and 31 m. high. To degas the oil, two towers were used with 100-200 cu. m. throughput per tower per hour. Vacuum was produced by liquid seal pumps, and the gases leaving the towers were led to the boilers and used for boiler fuel.

The oil was stripped in a steam-heated pot still in which steam was led directly into the oil. The oil leaving the still was cooled by mixing with water at about 50° C. and was filtered to remove the polymers that had separated. The oil was decanted from the water. Part of the oil (3 to 5 m^3/hr.) was returned to the distillation while the balance was returned to circulation.

In the distillation, the oil was regenerated. There were four stills with a steam pressure of 200 atm. The capacity of each was 1 to 1.2 m^3/hr. of clean oil. When aromatic oil was used, the steam treatment was omitted, and the regeneration consisted only of degassing and distillation.

The gas leaving the Feld washers was pumped by three turbo blowers through the water washers and the sulphur cleaning plant. For the water wash there were three Raschig towers, two 3.5 m. and one 4.0 m. in diameter by 16 m. high. The Raschig rings were on two trays, and the total volumes filled were 120 cu. m. and 160 cu. m. respectively. The water leaving these towers was used in the carbon black plants as spray water in the coolers after the cyclones. This water overflowed to the settling tanks, then to the vacuum degassers, then to a cooler and then back to the water washers. To degas this water, there were two towers of 3.5 m. diameter by 31 m. high, with four trays and a total filled volume of 250 cu. m. A third tower was under construction. The vacuum was produced by three liquid sealed vacuum pumps, each having a capacity of 3000 cu. m. with an absolute pressure of 160 mm. Hg.

When the 10 groups of arc converters were operating, 20 to 30 tons of steam were delivered. The condensates were cooled in three condensers in series, and the residue gas was evacuated with vacuum pumps. The gas contained 10-15 vol. per cent of hydrocyanic acid (HCN). The removal of this acid was still experimental. The liquid seal vacuum pumps served as water washers for the acid and about 1 cu. m. of HCN could be distilled out of 3 to 5 m^3/hr. of pump seal water. This water contained from 0.5 to 1.5% HCN.

After the water wash the gas was sent to the sulphur removal plant, consisting of six boxes, 6 m. diameter and 7 to 12 m. high. These were filled with Luxmasse in 12 trays about 2.5 m. high each. The gas passage was split before reaching the de-sulfurizing plant, each stream going through two such boxes. The gas was again washed and stored in a nearby gas holder.

Acetylene Recovery

Acetylene was recovered from the desulfurized and recycle gas by absorption in water at 18 atm. pressure six complete units being used. Each unit consisted of a 4-stage compressor with intercoolers to prevent overheating of the partially compressed acetylene-containing gas; a 66-plate (perforated) absorption tower with pure water as absorbent; 2-stage expansion, first to 2 atm. through an expansion turbine to a separator, the expanded gas containing some 45% acetylene being recycled to the 4-stage compressors, and second to 1 atm. with recovery of 92% C_2H_2 gas; then to 2-stage flashing at 0.15 and 0.05 atm. pressure.

The recovered gases from the atmospheric and vacuum flashing averaged 96% acetylene, the balance being N_2, CO_2, CH_4, C_2H_4, H_2 and small amounts of di-acetylenes. The water from the last vacuum flash was raised to atmospheric pressure, stripped with residual gas from the Linde low temperature fractionation plant, aerated and cooled in cooling towers, and returned to the absorbers at a maximum temperature of 26° C. The gas recovered by stripping was recycled to the arc converters.

Acetylene Purification

The recovered acetylene gas was purified by scrubbing with wash oil in a 30-tray bubble plate tower, the exit gas from the scrubber containing 97% acetylene being considered as purified material for the four-stage synthesis to butadiene. The rich wash oil was to have been stripped of higher acetylenes in the lower section with arc recycle gas and of acetylene in the upper section with a small amount of recycle gas.

This two-stage stripping was not successful and the stripper was operated as a single stage. This system did not provide for direct separate recovery of the diacetylenes except as they appeared in the recycle gas.

Hydrogen Recovery

The exit gas from the acetylene scrubber contained less than 0.1% acetylene, but appreciable quantities of hydrogen and ethylene. This gas was first treated for hydrogen recovery in the liquefaction plant. In this plant, the gas was divided into five fractions: Propane and higher, ethylene-ethane, methane, Co-nitrogen, and hydrogen. The raw gas at 60 atm. pressure was cooled by counter-current heat exchange with the product streams to −15° C., at which temperature with further heat exchange from the product gases the propane fraction was condensed and trapped from the condenser. This fraction was flashed to 1 atm. and added to the methane fraction as arc recycle gas.

The partially fractionated gas was further cooled to —140° C. by countercurrent heat exchange with product streams, passed through a condenser and the ethylene-ethane fraction liquefied using the hydrogen fraction and a medium pressure nitrogen refrigeration coil. The liquefied nitrogen was obtained by compression to 200 atm. and condensation by heat exchange with one of the several cold gas streams, usually the methane fraction. The ethylene-ethane fraction was flashed at 1 atm. and sent to the ethylene recovery plant.

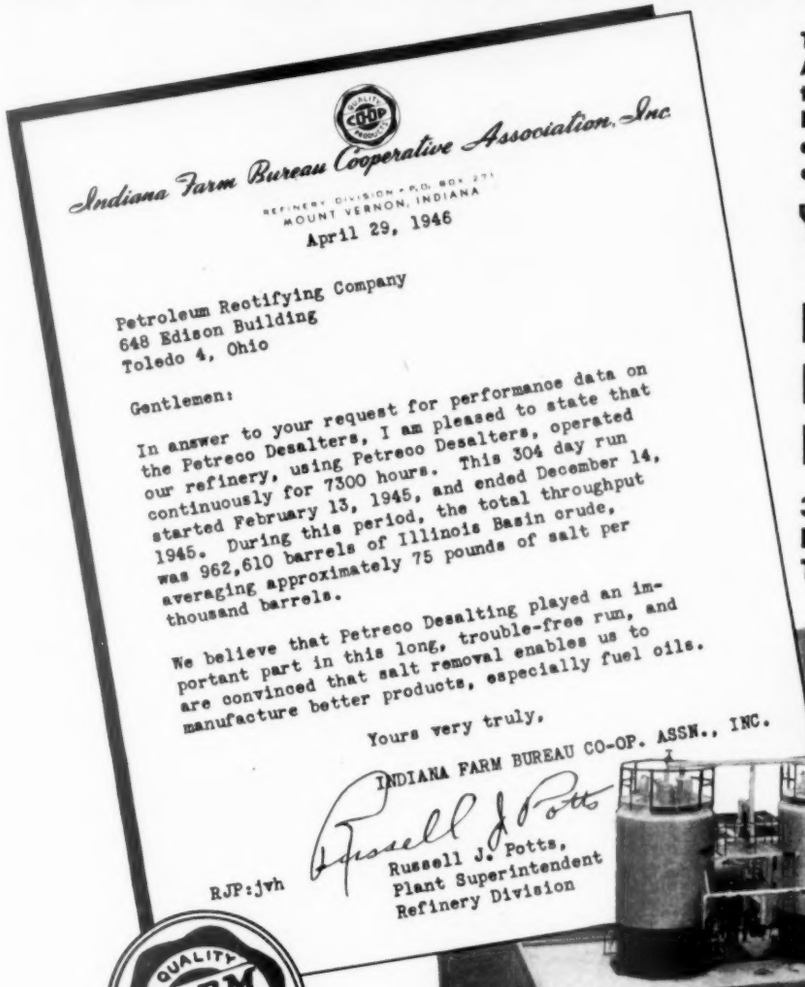
The gas now free of ethane and higher at —145° C. was cooled to —170° C., with the nitrogen, carbon monoxide-nitrogen, and methane streams, and the methane fraction condensed with an outside nitrogen cooling coil. The methane fraction was flashed at 1 atm. and returned through countercurrent heat exchange to the arc recycle gas stream. This recycle gas consisted of the methane and propane fractions and contained about 75% CH_4. The remaining gas, not at —185° C., was fed into the base of a 2-section rectifying column. In the lower or high pressure section of the column, a CO-nitrogen fraction was separated as bottoms using liquid nitrogen at 1 atm. pressure as reflux for the section and a liquid hydrogen re-boiler as a bottoms cooler. The CO-nitrogen fraction was vaporized in the medium pressure nitrogen and atmospheric pressure nitrogen condensers and the vaporized fraction then passed through countercurrent heat exchangers. This gas was used as an inert stripping gas.

A part of the hydrogen fraction with 2-3% nitrogen was condensed in the upper section of the rectifying column and returned as reflux, using liquid nitrogen at 0.1 atm. absolute pressure. The product was withdrawn as a side stream through countercurrent heat exchangers and stored in holders for use in various hydrogenation processes within the chemical plant.

Ethylene Recovery

The ethylene-ethane fraction from the hydrogen recovery system, with additions from other sources, was fractionated in a Linde liquefaction plant. The raw gas contained approximately 15 to 25% ethylene, the remainder being principally methane with some ethane. The raw gas was first compressed to 30 atm. and cooled to —35° C. by ammonia refrigeration, then to —55° C. by countercurrent heat exchange with cold methane fraction, to —95° C. in the re-boiler coil of the methane fractionator, to —105° C. by countercurrent heat exchange with the ethane intermediate fraction and the methane fraction, and was then flashed to 1 atm. pressure and —140° C. in the top of the methane column. The overhead from the

304 DAYS ON STREAM...



Indiana Farm Bureau Cooperative Association, Inc.

REFINERY DIVISION • P.O. BOX 271
MOUNT VERNON, INDIANA

April 29, 1946

Petroleum Rectifying Company
648 Edison Building
Toledo 4, Ohio

Gentlemen:

In answer to your request for performance data on the Petreco Desalters, I am pleased to state that our refinery, using Petreco Desalters, operated continuously for 7300 hours. This 304 day run started February 13, 1945, and ended December 14, 1945. During this period, the total throughput was 962,610 barrels of Illinois Basin crude, averaging approximately 75 pounds of salt per thousand barrels.

We believe that Petreco Desalting played an important part in this long, trouble-free run, and are convinced that salt removal enables us to manufacture better products, especially fuel oils.

Yours very truly,

INDIANA FARM BUREAU CO-OP. ASSN., INC.

Russell J. Potts

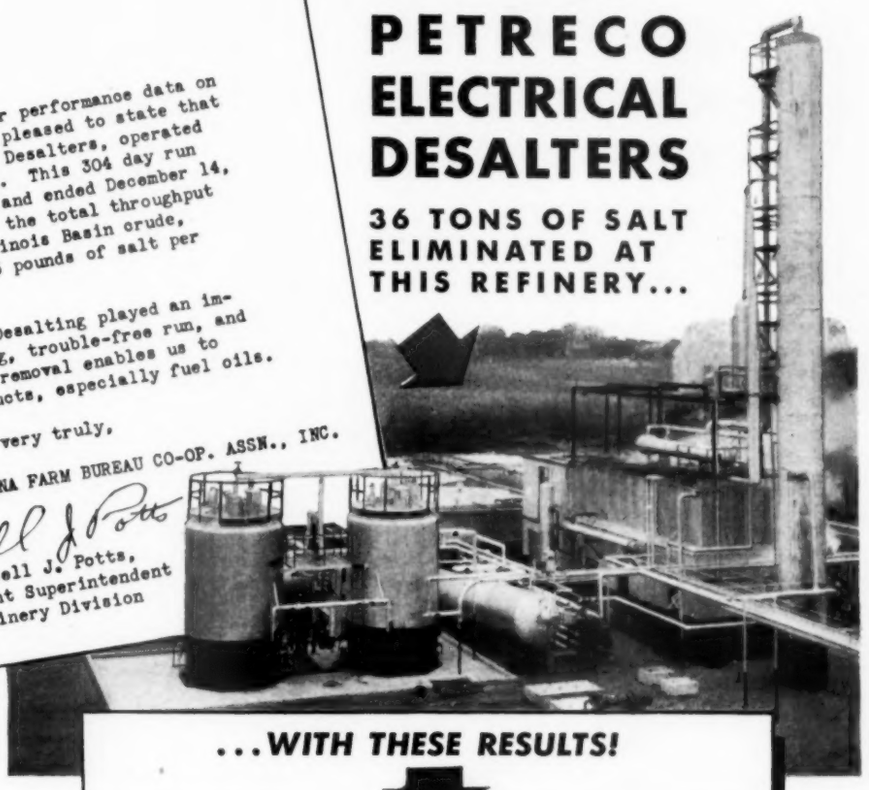
RJP:jvh

Russell J. Potts,
Plant Superintendent
Refinery Division

The Indiana Farm Bureau Cooperative Association, Inc., Refinery operated continuously from February 13, 1945, to December 14, 1945. All the crude processed, 962,610 bbls. of Illinois Basin crude, was first desalted

WITH PETRECO ELECTRICAL DESALTERS

36 TONS OF SALT ELIMINATED AT THIS REFINERY...



QUALITY FARM BUREAU PRODUCTS

...WITH THESE RESULTS!

	Hours on Stream		Throughput	
Date (1945)	*Monthly*	*Cumulative*	*Bbls./Mo.*	*Cumulative*
Feb. 13-28	375	375	49,629	49,629
March 1-31	744	1119	98,865	148,494
April 1-30	720	1839	95,830	244,324
May 1-31	744	2583	98,574	342,898
June 1-30	720	3303	95,915	438,813
July 1-31	744	4047	98,349	537,162
August 1-31	744	4791	96,025	633,187
Sept. 1-30	720	5511	92,104	725,291
Oct. 1-31	744	6255	100,002	825,293
Nov. 1-30	720	6975	95,758	921,051
Dec. 1-14	325	7300	41,555	962,606
TOTALS	7300		962,606*	

*The crude charge averaged 75 pounds of salt per thousand barrels. At this rate, the Petreco Desalters eliminated 72,195 pounds of salt . . . 36 TONS!

★ This is not the first surprisingly long on-stream period which Petreco Desalters have helped to lengthen. Petreco Electrical Desalters stop salt troubles *by eliminating salt.* For full particulars, have a Petreco engineer call on you . . . such consultations are part of Petreco Service.

PETROLEUM RECTIFYING COMPANY
A division of Petrolite Corporation, Ltd.

5121 So. Wayside Drive — Houston 1, Texas
648 Edison Building — Toledo 4, Ohio
530 West Sixth Street — Los Angeles 14, Calif.

PETRECO

DESALTING ★ ELECTRICAL PROCESS ★ DEHYDRATING

methane column passed through the heat exchangers mentioned above and was combined with the ethane fraction as arc recycle gas. The bottoms from this column, consisting largely of ethylene-ethane, were used as feed in the center section of the ethylene column. The ethylene was taken overhead as product, using purified ethylene at 6 atm. pressure expanded to 0.7 atm. for reflux and cooling in the column. The bottoms from the column, consisting principally of ethane, were flashed to atmospheric pressure, passed through the countercurrent heat exchangers mentioned above and combined with the methane fraction as arc recycle gas.

Results

The plant originally used mixtures of coke oven and hydrogenation residue gases as feed but, as previously stated, due to bomb damage operations were changed to natural gas from Bentheim. Under favorable conditions, about 100 MCF of a mixture of 50% recycle gas and 50% natural gas could be fed per unit per hour. The feed gas used and products obtained are tabulated in Table 2.

TABLE 2

Composition of Feed Gas and Products Using Bentheimer Natural Gas

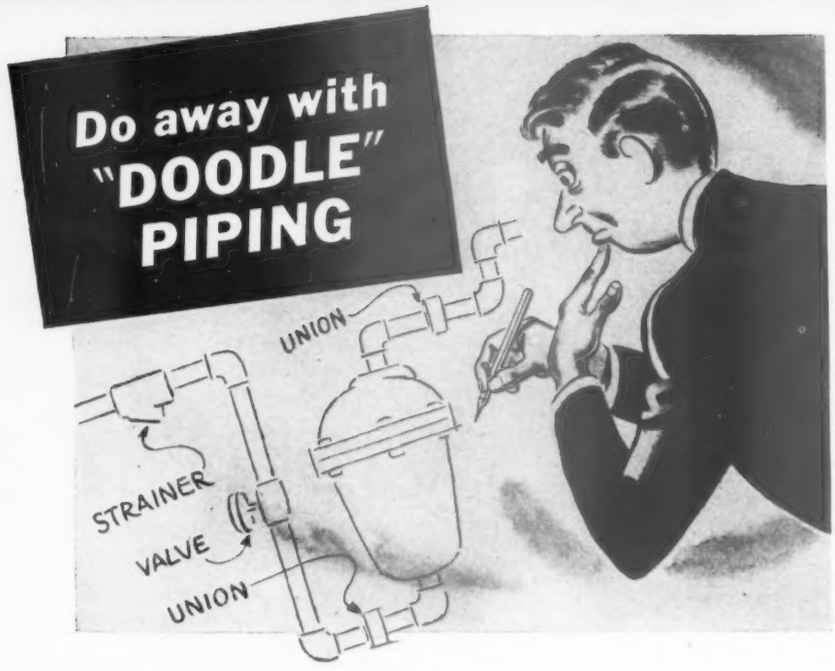
	Feed 2800 m.³/hr.	Product 4200 m.³/hr.
CO_2	0.3	
C_2H_2	1.5	13.3
Olefins	1.4	0.9 (—1.2%)
O_2	0.3	0.2
CO	3.0	2.9
H_2	2.5	46.0
CH_4 + Hom.	80.2	27.8
N_2	10.8	8.9

For the treatment of the quantity of gases mentioned above, about 7000 KW (measured on the A.C. side) were needed. In addition to the above, the arc converter gas contained the following constituents:

	Gr./cu. m.
HCN	2.5
Naphthalene	0.12-2.0
Benzol	1.5 -8.8
Diacetylene	15- 30
H_2S	Trace
Carbon Black	11

The recoveries of acetylene and carbon black per MCF of natural gas were 2.74 and 2.04 lbs. respectively. This yield of carbon black compares favorably with the reported average for the U. S. in 1943 of 1.71 lbs. MCF. However, it is doubtful that the quality is comparable with American channel blacks. Unfortunately, no sample could be obtained for comparison.

As a result, the economic evaluation of the cracking of natural gas to acetylene and carbon black in the arc converter in competition with American practice is still to be made. As previously stated, the arc converter was unique in design and the commercial installation at Huls demonstrated conclusively that this extremely interesting technological problem had been successfully solved.

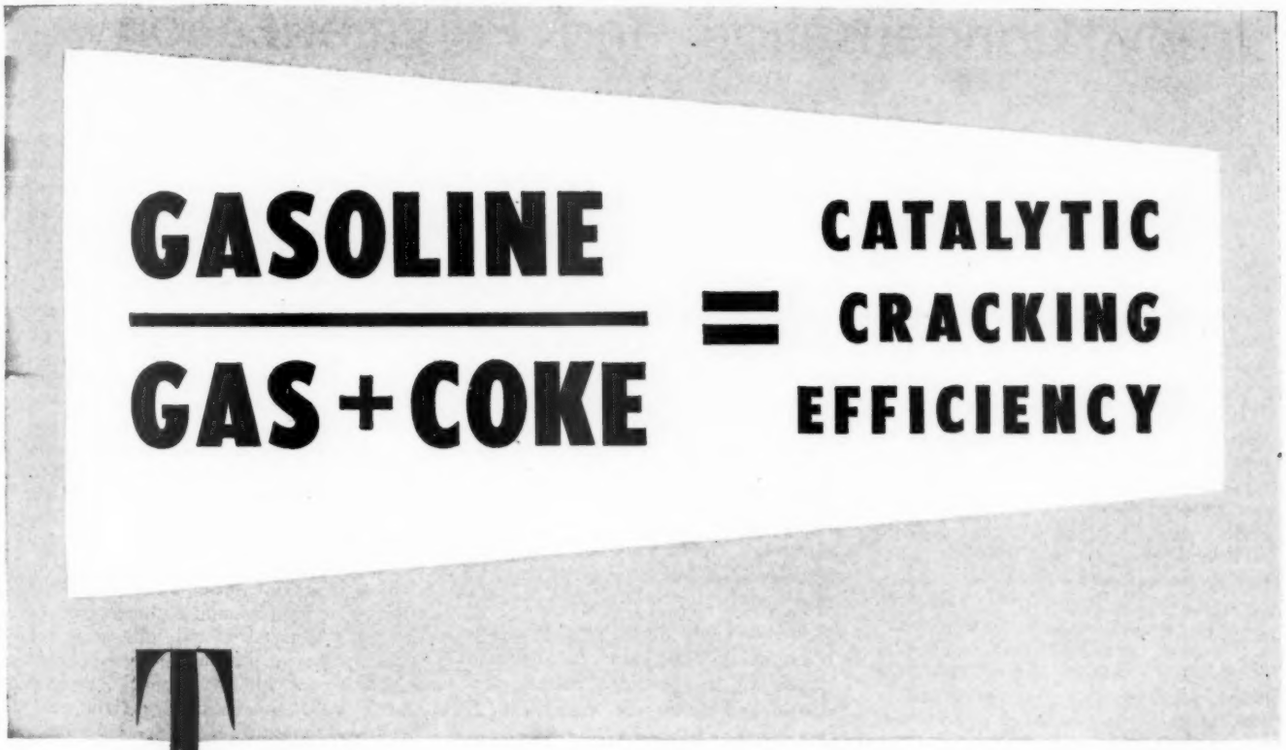


PIPING of inverted bucket steam traps is wasteful if it looks like scratch-pad doodling—in at the bottom and out at the top. But, Anderson Super-Silvertop Steam Traps permit BOTH elbow and straight-in-line piping with only one fitting. This common sense improvement gives reduced installation costs without split (pierced) gasket or cored passages.

Simplify your piping with Super-Silvertop. You save in first cost, on installation costs, besides the satisfaction of clean-cut, neat piping layouts. Have you sent for your free copy of the book, "How To Choose A Steam Trap"? Write today.

THE V. D. ANDERSON CO.
1974 West 96th Street
Cleveland 2, Ohio

SUPER-SILVERTOP STEAM TRAPS



This simple equation illustrates one of the outstanding advantages of Houdry fixed-bed and T C C processes. Their yield of gasoline in ratio to fixed-gas and coke is the highest of all catalytic cracking processes. Other factors which favor Houdry-licensed processes are:

- low investment cost
- low operating cost
- high liquid recovery
- high quality and yield of gasoline
- stable products
- continuous engineering service

They all add up to greater profitability. Interested refiners, with a sharp eye on competitive trends, are invited to ask for detailed estimates.

HOUDRY PROCESS CORPORATION
WILMINGTON, DELAWARE
NEW YORK OFFICE: 115 BROADWAY, NEW YORK 6

HOUDRY CATALYTIC PROCESSES
FOR VICTORY IN WAR
FOR PROGRESS IN PEACE

Production of Synthetic Lubrication Oil By Condensation and Polymerization

By GEORGE G. PRITZKER

Shell Development Co., San Francisco

The manufacture of synthetic lubricating oils from simpler hydrocarbons is becoming an increaslingly important phase of petroleum operations. Besides assuring us of a continuing supply of lubricants even if crude should ever become short, developments in this field are also making it possible to produce oils of any desired viscosity, boiling range, stability and pour point to meet particular applications.

In addition, these synthetics are opening up new uses for refinery gases which normally are either considered wastes or have little, if any, utility.

In this article the author reviews the development work which has been done, particularly in this country in recent years, on methods for synthesizing lubricants by condensation and polymerization reactions. Over 100 literature and patent references are cited, some dating back nearly three quarters of a century. Included are 78 U. S. Patents on the subject.

ALLIED technologists marched into defeated Germany side by side with our victorious armies to question her scientists, and to study and investigate methods employed by the Germans in waging war when lacking or deprived of essential war materials. Petroleum engineers were especially interested in Germany's synthetic oil production, which fundamentally was her chief and most reliable source of lubricating products.

Investigation discloses that Germany started the war with approximately six months' supply of liquid fuels. However, in the early years of the war, when she met with success, her oil supply increased because she had captured the oil fields of Poland, Hungary, and Rumania. Until they were bombed by the Allies and later captured by the Russians, the Ploesti oil fields in Rumania and the fields in Hungary were Germany's main source of crude oil. As late as March, 1944, the Ploesti oil fields produced approximately 155,711 tons per month of gasoline for German consumption.

After 1942, however, the picture began to change and Germany turned to her 13 synthetic oil plants, scattered over the country, for her chief source of oil products. The normal output of these plants was about 1,344,000 tons per month[1] which by mid-April of 1945 had been reduced to about 7½% due to allied bombing. Records indicate that two major factors in allied strategy played an important part in bringing Germany to her knees, one being the disruption of her railways and communication lines, and the other being the systematic bombing and destruction of her synthetic oil plants.

It is now quite well established that Germany relied mainly on the Fischer-Tropsch process and the Bergius process for producing synthetic lubricating oils. Available figures indicate that in 1942[2] she had produced by the Bergius process about 4,000,000 tons of motor fuel, and in 1943[3] 3,431,000 tons of aviation gasoline.

On the subject of fuels, it might be of interest to mention that Germany had only three plants producing tetraethyl lead which were never attacked or bombed all through the war. Had these plants been destroyed, most of Germany's airplanes would have been grounded and the war might have ended sooner.

Because Germany lacked the starting material for the production of synthetic lubricating oil, namely, unsaturated hydrocarbons, a great deal of attention on the part of her technologists was directed to the conversion of acetylene to ethylene by catalytic reduction, which, in turn, was polymerized to lubricating oil. This process appears to have been extensively used in Germany and is receiving careful study by our petroleum technologists. In fact, the chemistry and utilization of acetylene in the production not only of lubricating oil but of Buna S, ethylene glycol, butadiene, butanol, acetic acid, vinyl acetate, vinyl chloride, etc., have been greatly advanced in Germany, and its possibility as a starting material for numerous organic syntheses appears to be almost limitless.

German Synthetic Production

Available figures indicate that in 1940[4] approximately 2800 metric tons per month of ethylene were produced by hydrogenation of acetylene, and that this had increased to 6100 metric tons per month by 1942. In 1943, approximately 2890 tons per month of acetylene were converted to ethylene, a large proportion of which was used to produce lubricating oil.

In the closing days of the war, about 9000 tons per month of ethylene were produced by various processes other than the hydrogenation of acetylene, using palladium catalyst on silica gel. These processes included coke gas pyrolysis, ethane cracking, electric arc cracking, and decomposition of alcohol using aluminum as a catalyst, of which 13% went into the production of lubricating oil. Plans were under way to increase the production of ethylene to 19,000 tons per month.

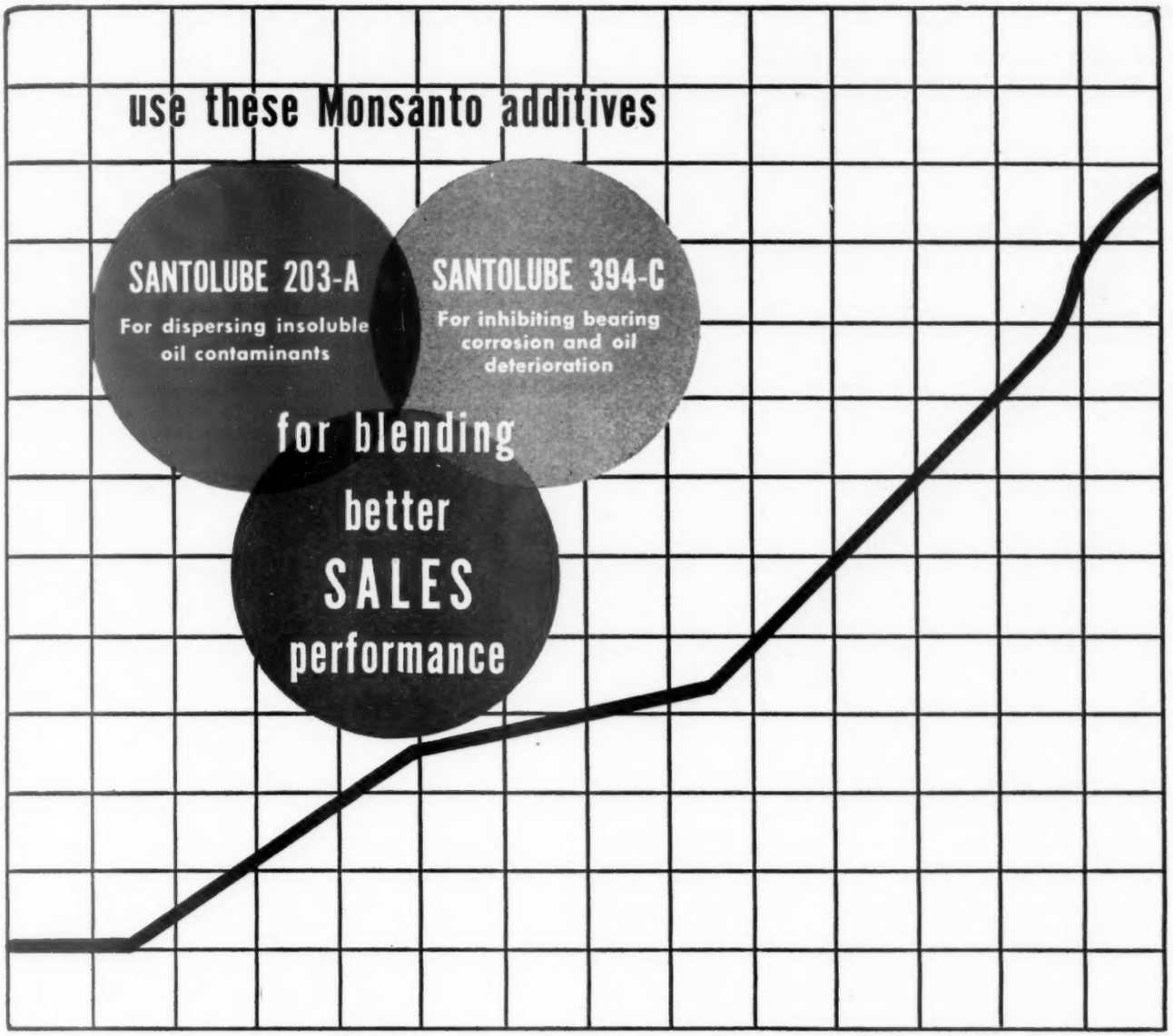
Although the wide applicability of acetylene as a starting point for the synthesis of lubricating oil and other materials is causing great excitement in this country, it is interesting to note that the conversion of acetylene to lubricating oil has been known for many, many years.

Wilde[5] in 1874 produced a yellow oil by condensing acetylene in an ozoniser. Ramsay[6] discloses that Sabatier and Senderens, by hydrogenating acetylene at high temperatures and pressures, not only

Mr. Pritzker

George G. Pritzker is well qualified to prepare any literature survey covering the lubricating oil field, having been associated with the technology of lubricants for nearly a decade. In addition, for nearly four years he was with the U. S. Patent Office examining patent applications on various lubricating compositions and lubricant additives.

A chemical engineering graduate of Brooklyn Polytechnic Institute, Mr. Pritzker recently left the Patent Office to become associated with Shell Development Co. as a member of the Patent Department of the company's Petroleum Technology Division. He will be remembered by NPN *Technical Section* readers as the author of the series of three articles on "Lubricating Oil Additives" published last fall (Oct. 3, '45 pg. R-793; Nov. 7, '45, pg. R-871; Dec. 5, '45, R-1001).



After all, there's only one reason for using Monsanto lubricant additives... to improve your sales performance by improving your product performance. That's what happens when you use "Santolube 203-A"* and "Santolube 394-C"*—both of which lend themselves to a wide range of "tailor-made" blending possibilities.

Santolube 203-A is a detergent and dispersant type additive that minimizes ring sticking by dispersing (or suspending) lacquer, sludge and other insoluble oil contaminants. It is extremely effective in compounding medium detergent, or dispersant oils, because it has very low dispersancy values. Its pour-depressant action affords additional blending economies.

Santolube 394-C definitely meets premium requirements of proved oxidation stability and bearing corrosion preventive properties.

Both of these additives are available in two pre-blended forms — Santolube 204 and 205 — in ratios approved for U. S. Army Specification 2-104B heavy-duty oils.

Bulletins on Monsanto's complete line of oil-addition agents are available at the nearest Monsanto Office. Or, write: MONSANTO CHEMICAL COMPANY, Petroleum Chemicals Department, 1700 South Second Street, St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Cincinnati, Birmingham, Los Angeles, San Francisco, Montreal, Toronto.

*Reg. U. S. Pat. Off.

MONSANTO CHEMICALS
SERVING INDUSTRY...WHICH SERVES MANKIND

obtained a liquid corresponding in color, odor, and fluorescence to a natural petroleum, but by varying the conditions as regards temperature, pressure, and concentration, succeeded in synthesizing petroleum of varying characteristics. Also, by using alpha particles from radon, Hesig[7] converted dimethyl acetylene to lubricating oil liquid.

Lillienfeld[8] stated that investigation has shown that viscous oils were produced by the action of acetylene on high boiling portions of tar oils. He produced lubricants by subjecting higher boiling portions of tar oils obtained from solvent naphtha to boiling between 145-200° C., or by isolating from hydrocarbons mesitylene, pseudocumene, etc., and then treating these fractions under heat with gaseous acetylene in the presence of aluminum chloride.

Waterman[9] also produced high viscosity index lubricating oils by introducing aluminum chloride into a low-value stock, acetylene or gases containing acetylene, and reacting at temperatures below 50° C.

Process Not German Brain Child

It may also be of interest that while Dr. Bergius was the first to produce lubricating oil on a commercial scale by hydrogenating coal and various other carbonaceous materials, this process was not a German brain child. As early as 1869, the Frenchman Berthelot[10] proved that coal could be hydrogenated and converted into oil by treating it with hydriodic acid in sealed glass tubes in a furnace heated to 270° C.

Neither were the Germans the first to utilize unsaturated olefins, such as ethylene, in order to produce synthetic lubricating oil; for in 1879 Balsohn[11] reacted ethylene with aluminum chloride to form a liquid which on treatment with water yielded an oil. Due credit, however, must be given to Fischer and Tropsch for working out a commercial process of converting water gas or carbon monoxide and hydrogen into unsaturated olefins which on polymerization under suitable conditions produce lubricating oil.

The above statements are not made to discredit or cast doubt upon the technical ability of the Germans, for they have demonstrated beyond a reasonable doubt that they possess great technical and mechanical skill. It is important to note, however, that Germany has no monopoly on technical and mechanical ability in any scientific field, and that it is dangerous and fallacious to look upon her as the guiding light of the scientific world.

Necessity compelled Germany to engage in intensive study and to develop commercial methods of producing synthetic lubricating oil. Any nation as large and as aggressive as she and lacking in natural oil deposits, undoubtedly would have developed her synthetic oil industry to the same degree, since lubricants are necessary in waging war.

The United States, France, Britain, and Russia also have made important contributions to the development and better understanding of synthetic oil production.

Although so far only the polymerization and hydrogenation methods of producing synthetic lubricating oils have been mentioned, many other methods are employed to produce this material. Voltolization, or the silent electric treatment of various hydrocarbons and fatty materials, also results in the production of lubricating oil. This process was used successfully by De Hemptinne[12] to obtain lubricating oil by subjecting hydrogenated fatty oils or mixtures of fatty oils and mineral oil to silent electric discharges.

Produced in Belgium in 1912

In 1912, lubricating oils utilizing the DeHemptinne process were produced commercially in Belgium by treating a mixture of mineral oil and fatty oil in a horizontal, cylindrical, rotating drum having scoops which caused the oil to drip over electrodes in the center of the apparatus. During 1914-1918, the Germans seized and used this plant and constructed many others in Germany which used this process to produce lubricating oil.

Synthetic lubricants can be produced by the combination of various organic and inorganic materials which in themselves possess little, if any, lubricating properties. In addition, synthetic lubricants can be prepared by polymerization of saturated hydrocarbons through an intermediate decomposition process, or by reacting chlorinated aliphatics or aromatics in the presence of catalysts and by alkylation.

One of the most highly developed processes in the production of synthetic lubricating oil is the thermal or catalytic polymerization or condensation of unsaturated olefinic hydrocarbons, such as ethylene. Just what takes place during polymerization is difficult to determine. Whereas cracking is essentially a molecule-splitting process, polymerization, on the other hand, is a molecule-joining process; in other words, polymerization is a chemical method of making a molecule combine with other molecules of the same type to form a larger one of any desired size. In many instances in literature the terms polymerization and condensation are used interchangeably. The distinguishing factor is that during condensation the building up process of the molecules is accompanied simultaneously by a splitting out of water, acids, etc.

Catalyst Reduces Temperature

In the thermal polymerization of olefins, temperatures as high as 1000° F. and pressures of over 1,000 pounds are required; whereas by the introduction of a catalyst the temperature can be reduced to 500° F. and the pressure to 200-300 pounds[13]. Also, by controlling the stages of polymerization, a desired end product can be formed. Thus propylene can be dimerized or polymerized to hexylene under controlled conditions in the following manner:

$$CH_3-CH=CH_2 + CH_2=CH-CH_3 \rightarrow CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH=CH-CH_3$$

The polymerization process can also be accelerated not only by the use of a catalyst but by such methods as heat, pressure, ultra-violet light, and electric discharge. Each of these factors plays an important part in the resultant end product. Thus, in the production of synthetic lubricating oil by thermal treatment of ethylene, temperatures of at least 325° C. must be used[14]. Polymerizing the ethylene in the presence of zinc chloride, the temperature can be reduced to 230-275° C. Other catalysts which can be employed are aluminum chloride, stannic chloride, and titanium tetrachloride. The action believed to be taking place during the polymerization of ethylene with aluminum chloride is:

1. Polymerization of ethylene to higher olefins.
2. Isomerization of these olefins to produce cyclo-paraffins.
3. Cracking of these isomerized products under the influence of aluminum chloride to produce light paraffin hydrocarbons and heavy oils less rich in hydrogen.

A comprehensive study on the production of synthetic lubricating oil was made by Sullivan, et al.,[15] in which it was disclosed that polymerization in the presence of a catalyst at low temperatures (70-200° F.) resulted in a viscous oil product. The resultant viscous oils varied greatly when different unsaturated materials were polymerized under like conditions. It was also observed that the longer the straight chain in the unsaturated stock polymerized, the lower was the temperature-viscosity coefficient of the resulting oil.

More Catalyst Increases Yields

Another point of interest observed was that the higher the end point of the distillate polymerized, the lower the temperature coefficient of the polymerized oil obtained, although the yield was somewhat lower. It was also observed that at lower temperatures the time of reaction was longer, but this could be shortened by increasing the amount of catalyst used, which, in turn, resulted in increased oil yields, although increases in sludge formation also were noted.

Other factors observed were that with normal-α-olefins the viscosity index increased with the increased molecular weight of the olefin. With isomeric olefins, the viscosity index of the polymerized oils increased with the degree of the branching of the initial olefin. When polymerized, cyclic olefin, cyclohexene, and turpentine possessed properties of naphthenic oils. Polymerization of diolefins in the presence of aluminum chloride resulted in resinous polymers which were unsuited as synthetic lubricating oils. Temperature changes did not

AEROCAT* MS-A

(MICROSPHEROIDAL)

SYNTHETIC FLUID CRACKING CATALYST

FIRST IMPROVEMENT IN SYNTHETIC CRACKING CATALYSTS

AEROCAT MS-A (x 100)

FRESH GROUND CATALYST (x 100)

Compare the spheroidal shape and controlled particle size distribution of Aerocat MS-A with the irregular, sharp particles found in ground catalysts. But don't stop there. The following superior physical features of Aerocat MS-A also result in operating and economic advantages:

Minimum amount of fines
Resistance to attrition
Increased catalytic efficiency
Improved flow characteristics

For the complete story of this new microspheroidal catalyst, contact a Cyanamid technical field service representative. He will be very glad to furnish any desired additional information concerning this improved synthetic cracking catalyst, Aerocat MS-A.

When Performance Counts . . . Call on Cyanamid

AMERICAN CYANAMID & CHEMICAL CORPORATION

(A Unit of American Cyanamid Company)

30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

*Trade mark of American Cyanamid & Chemical Corporation denoting cracking catalyst of its manufacture

have an effect on the viscosity index of the oil but did affect the cyclic sludge. The most suitable reaction temperature was observed to be between 130-135° C. and the preferred catalyst was aluminum chloride, although other catalysts, such as silicon tetrachloride, titanium tetrachloride, stannic chloride, PCl_5, bismuth trichloride, ferric chloride, mixtures of ferric chloride and aluminum chloride, boron fluoride, and Attapulgas clay activated with hydrochloric acid can be used.

Friedel and Craft Authorities

Undoubtedly, the entire structure of catalytic polymerization (one branch of which is utilized in producing synthetic lubricating oil from olefins) is based on the word of the Frenchman Friedel and the American Craft. In 1877, Craft accidentally observed the action of metallic aluminum on amyl chloride and, in conjunction with Friedel, started and developed a whole series of organic syntheses using aluminum chloride as the catalyst. That same year, Friedel and Craft investigated the possibility of converting olefins into lubricating oil with the aid of aluminum chloride.

These two great men of science also devoted much of their time to the study of organic and inorganic compounds of silicon, which at present is receiving increasing attention as a highly specialized lubricant.

The same year that Friedel and Craft synthesized their lubricating oil by polymerizing olefins in the presence of aluminum chloride, Abel[16] received a British patent for producing oily products by condensing unsaturated hydrocarbons with aromatics in the presence of aluminum chloride.

To obtain a lubricating oil, Engler and Rontala[17] reacted trimethyl ethylene and aluminum chloride at ordinary temperatures. According to Ipatioff[18], synthetic lubricating oils were produced by polymerizing commercial C_2H_4 at temperatures of 150-300° C. The aluminum chloride was transformed into a true organo-metallic compound resembling in some respects the Grignard compounds of magnesium and showing marked activity toward oxygen and water.

Many Methods Patented

The United States and British patent literature, as well as the German, abound in disclosures of various methods of producing synthetic lubricating oil by condensation and polymerization. In 1919, Brownlee[19] obtained a patent for producing lubricating oil from petroleum distillates containing a considerable percentage of unsaturated hydrocarbons, first treating the distillate with acid to remove objectionable matter and then polymerizing the unsaturated hydrocarbon in the presence of a catalyst such as anhydrous aluminum chloride or anhydrous hydrochloric acid, at temperatures varying from ordinary to 300-400° F.[19]. Sludge and vapors formed during the reaction were removed and the product neutralized with soda and then sent through a washer to remove the soda.

Klever[20] produced valuable pressure lubricating oil by condensation and polymerization of coal tar oils such as anthracene oils and naphthalene oils and distillation products of coal tar pitch containing bases and phenols of high molecular weight capable of condensing by prolonged heating under pressure. Air was admitted into the reaction under controlled conditions; otherwise, the oil is converted into pitch. The thickening of the oil is due chiefly to the condensation of the bases and of phenols. The process of condensation and polymerization may be assisted by the addition of catalysts such as Florida earth; kieselguhr; animal charcoal; powdered graphite; chlorides of metal, such as chlorides of Al, Zn, Fe, Cd, Cu; metallic powder; powdered metal oxides and hydroxides such as Fe, Ni, Ca, Cu, Al, Zn, Pb; alkali and alkaline earth metals.

Lubricating fractions obtained from olefins and mixtures thereof with aromatic hydrocarbons such as benzol, toluol, xylol, etc., were produced by Ramage[21]. A condensate of olefins and aromatic bodies was acid-treated with H_2SO_4 and the acid sludge removed from the supernatant mixture of liquid hydrocarbon. The latter was fractionated, and fractions boiling between 300-450° C. proved to have good lubricating properties.

Unsaturated Components Removed

McAfee[22] produced lubricating oil from solar oil, gas oil, etc., or improved the quality of oils by heating them with $AlCl_3$ and passing hydrogen-containing gases such as methane, ethane, propane, ethylene, propylene, etc., through them doing away with the unsaturated components present in the oil, stabilizing it, and improving its color.

The polymerization of olefins such as ethylene and propylene at 130 atm. and room temperature in the presence of boron fluoride or nickel catalysts to produce lubricating oil is disclosed by Otto[23].

The Fischer-Tropsch process for the production of lubricating oil, upon which Germany partly depended in this war, basically consists of subjecting carbon monoxide and hydrogen to controlled conditions in order to cause the oxygen molecules to split and combine with hydrogen, and then polymerizing the unsaturated hydrocarbon fraction to lubricating oil in the presence of a catalyst. The Fischer-Tropsch process provides an outlet for gas-works coke or for coke-oven gas.

With improved catalysts such as iron, nickel, and cobalt, with supports of Kieselguhr, silica-gel, or asbestos, and promoters of thorium or manganese, and the use of elevated temperatures of 180-230° C., increased yields of lubricating oil were obtained using the Fischer-Tropsch process. To prevent the poisoning of the catalysts by sulfur, the organic sulfur compounds can be hydrogenated over a copper oxide-lead chromate catalyst and removed as H_2S with the aid of alkaline potassium ferricyanide. A preferred synthetic oil catalyst for the Fischer-Tropsch process has been observed to be nickel-manganese-aluminum.

The Wietzel patent[24] utilized the Fischer-Tropsch process in a step-wise manner to produce lubricating oils. Mixtures of hydrogen and oxides of carbon (water gas) were treated under such conditions that only hydrocarbons of low boiling point range were obtained; this was brought about by allowing the reaction gases to remain in contact with the catalyst of Group VIII of the Periodic System at temperatures of 270-350° C. for a short period of time. The hydrocarbons of low boiling point, which are mainly propylene, butylene, isobutylene, pentylene, propane, butane, isobutane, pentane, and ethylene, are removed from the reaction gases and treated under pressure of 100-1000 atm. and temperatures of 45-250° C. with AlCl. or similar condensing agents, such as $AlBr_3$, $ZnCl_2$, BCl_3, BF_3.

Kogasin I and Kogasin II

Fischer, et al.,[25] using the Fischer-Tropsch process, produced hydrocarbons of the paraffin and olefin series which were designated as Kogasin I (motor fuel) and Kogasin II (gas oil fraction). The Kogasin I component contains unsaturated hydrocarbons boiling up to 220° C. which when polymerized in the presence of a catalyst produce lubricating oil. The Kogasin II fraction is first chlorinated and then treated with activated aluminum metal until the material is free of chlorine; it is then polymerized.

Synthetic lubricating oil also can be produced by taking Kogasin and condensing it with aluminum chloride and aromatics such as xylol, benzol, toluol, naphthalene, methyl naphthalene, and tetralene.

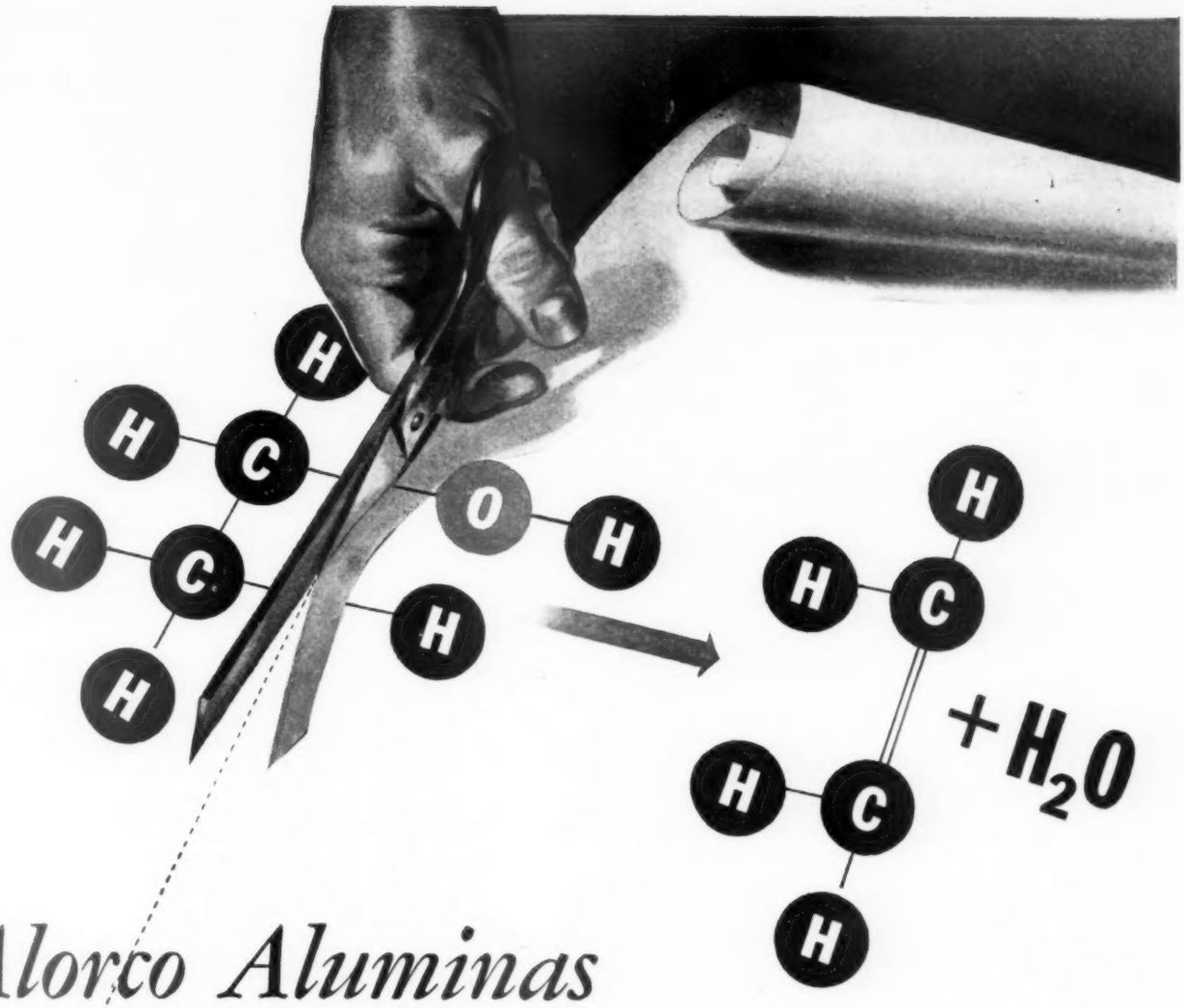
When hydrogenated, the above oil was extremely stable to oxidation and had a minimum of carbon formation and a very desirable low pour point.

A super-lubricant[26] was obtained by the above Fischer-Tropsch process by keeping the aromatic used fairly low in relation to the percentage of chloro-Kogasin, so as to alkylate the aromatic, or by reacting low boiling synthetic hydrocarbons which are partly alkylated aromatics with chloro-Kogasin to form more highly alkylated materials.

Residuum Produces Highgrade Stock

Egloff[27] treated residuum produced from cracked petroleum oil with molten aluminum chloride under violent agitation, with the result that the aluminum chloride acted chemically upon the residuum and produced very stable hydrocarbons of a polymeric character suitable for high grade lubricant stock. The operation may be conducted under suitable superatmospheric pressures and under temperatures proper for cracking oil. After this treatment, the residuum may be distilled with steam or under vacuum and separated into suitable fractions which may be acid-treated, neutralized, and washed in order to produce a desired refined oil.

Michel[28] disclosed the reaction of ole-



Alorco Aluminas

sharpen your tools for destructive dehydration (and other catalytic reactions)

Pure and carefully controlled in chemical content, Alorco Aluminas help keep reactions "on the beam". There's less likelihood of uncontrolled side reactions and poisoning when your catalysts have this base.

Alorco Aluminas—already serving industry widely as catalysts, carriers, and auxiliary catalysts—have physical properties suiting them to long life with continued high productive capacity. They are able to withstand high temperatures. Where their pores become clogged with carbon this deposit can be burned off, and they're ready to go to work again.

Check the value of Alorco Aluminas in your own processes. We'll send you samples for trial—a pound or a ton. Call the nearby Alcoa office. Or write ALUMINUM ORE COMPANY, Subsidiary of ALUMINUM COMPANY OF AMERICA, 2000 Gulf Building, Pittsburgh 19, Pennsylvania.

ALUMINUM ORE COMPANY

ALORCO

Aluminas and Fluorides

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

fins upon polynuclear hydrocarbons such as polynuclear aromatic hydrocarbons or oxygen-free derivatives thereof containing at least one double linkage in the nucleus, in the presence of a catalyst and inert solvent, in order to produce an oily product. The aromatic compounds used are naphthalene, methyl or ethyl naphthalene, acenaphthene, fluorene, anthracene, phenanthrene, etc. The olefins used in the reaction are ethylene, propylene, butylene, hexylene, etc. The catalysts used are inorganic halides, particularly anhydrous metal halides such as aluminum chloride, aluminum bromide, iron chloride, boron fluoride, as well as benzene hydrocarbons and halogen acid; hydrogen chloride can be used, for example. The inert solvents employed in the reaction are petroleum ether, benzene, hexahydrobenzene, hexahydrotoluene, decahydronaphthalene, etc., and help to facilitate the reaction and prevent undesirable secondary reactions. The temperatures and pressures used depend upon the substances reacted; temperatures varied from room to 300° C. As an illustration, propylene gas was mixed with tetrahydronaphthalene and anhydrous ferric chloride and petroleum ether at a temperature of 100-120° C. under 25 atm. pressure to produce an odorless transparent oil boiling from 150 to 200° C. at 22 mm. pressure.

Hofmann[29] produced viscous oils by polymerizing olefins such as ethylene, propylene, butylene, or cyclohexene and their mixtures with boron fluoride. The reaction was accelerated by the presence of hydrogen halides such as hydrogen fluoride, bromide, iodide, or chloride, and moisture. To illustrate the reaction, Hofmann took 100 part of ethylene and treated them with 10 parts of boron fluoride and 12 parts of hydrogen iodide under 100 atm. pressure to yield 75 parts oil in 10 hrs.

Russian Attention to Synthetic Oil

Because she does not possess large resources of crude oils high in lubricating oil, Russia has paid increasing attention to the production of synthetic lubricating oil by the conversion of gaseous olefins in the presence of catalysts. In the Ural-Kuznetzk Basin alone, in 1932, the yield of olefins was approximately 300,000 tons. Petrov[30] condensed "ethylene concentrates," containing 20-33% olefins and the remainder composed of methane and hydrogen, in the presence of aluminum chloride at 40-60 atm. pressure, varying the temperature from room to 100° C., to produce synthetic lubricating oil. The condensation was carried out under circulation in order to prevent the oil from coating the catalyst and thus inactivating it.

Further work by the Russians on this line is disclosed in the *Journal of Applied Chemistry*[31], in which a number of articles describe the production of synthetic lubricating oil from cracked distillates from *Surakhany Plug* (ceresine) and from *Grozny* (paraffins). The distillates were polymerized with the use of heat and a catalyst at temperatures of 65 and 125° C. in the presence of 3% aluminum chloride.

Properties Depend on Raw Material

It was observed that the properties of the synthetic lubricating oil depended on the composition of the raw material used in the cracking unit, and that the maximum amount of unsaturates produced during cracking is influenced by pressure. It was also noted that temperature is not a factor in the quality of an oil obtained from cracked distillates from Vichers Units when polymerized at 50-60° C. or 115-130° C. However, polymerizing *Surakhany Plug* at 125° C. produced a lower quality of oil than at 65° C., because of the high aromatic content in the distillate which brought about a condensation of the unsaturate with the aromatic, affecting adversely the property of the lubricant.

Halloran[32] treated high sulfur-containing hydrocarbon oils or highly unsaturated hydrocarbon oils with aluminum chloride or equivalent metallic halides under controlled conditions to permit an efficient polymerization and desulfurization of the oil without permitting decomposition of the polymerized product into low boiling point oils or naphtha, and produced a lubricating oil containing a high percentage of saturated polynaphthenes which possess excellent lubricating properties and have high resistance to oxidation. The amount of aluminum chloride used varied from 0.5 to 10% of the oil, and the temperatures ranged from 450 to 650° F.

Pier[33] produced valuable lubricating oil by subjecting to condensation distillates of liquid hydrocarbon products such as mineral oil, tars obtained in any manner, products secured by destructive hydrogenation of various kinds of coal, tars, mineral oil, etc., and treating the products thus formed wholly or in part with hydrogen at elevated temperatures, preferably under pressure and, if desired, in the presence of a catalyst.

By condensation is meant reactions in which molecules of the initial materials are combined to form larger molecules with or without the splitting off of atoms such as hydrogen, free halogens, oxygen, and sulfur, forming simple compounds such as water, hydrogen halides, and sulfuretted hydrogen.

In the case of condensation with chlorine:

$$C_{14}H_{16} + Cl_2 \rightarrow C_{14}H_{25}Cl + HCl$$
$$C_{14}H_{25}Cl + C_{12}H_{22} \rightarrow C_{26}H_{46} + HCl$$

In the case of condensation with oxygen:

$$4C_{12}H_{24} + O_2 \rightarrow 2C_{24}H_{46} + 2H_2O$$

In the case of the combination of two equal molecules without the splitting out of atoms, a specific condensation is formed, that is, the so-called polymerization.

The condensation may be carried out in different ways, such as at ordinary, elevated, or reduced pressure, in the presence of catalysts such as aluminum chloride, ferric chloride, P_2O_5, etc., or at elevated temperatures in the presence of gases or vapors having a condensing action.

The subsequent treatment with hydrogen is carried out under conditions that only produce high boiling point fractions and in the presence of catalysts such as a metal from the sixth group of the Periodic System. The hydrogenation is effected at temperatures ranging between 250 and 550° C.

Continued Next Month

The balance of Mr. Pritzker's survey of literature and patents on the production of synthetic lubricants by condensation and polymerization will be presented in the next issue.

References

(1) *Petroleum Times*, 49, 379 (May 26, 1945).
(2) *Chemistry*, June, 1945.
(3) *Oil and Gas Jour.*, Nov. 3, 1945.
(4) *Chem. and Eng. News*, Oct. 25, 1945.
(5) *Dent. Chem. Ges. Ber.*, 2, 355 (1874).
(6) "The Significance of Nickel in Petroleum," *Jour. of the Inst. of Petroleum*, 10, 87 (1924).
(7) *Jour. of the Amer. Chem. Soc.*, 52, 5165 (1930).
(8) U.S.P. 1563203 (1925).
(9) U.S.P. 2088500 (1937).
(10) Waterman, "Hydrogenation in the Petroleum Industry," *Jour. of the Inst. of Petroleum*, 10 (1925); *Bull Soc. Chim.*, 11 (Series 2), 278 (1869).
(11) *Bull. Soc. Chim.*, 31 (Series 2), 539 (1879).
(12) U.S.P. 797112 (1905).
(13) *Petroleum Refiner*, July, 1944, p. 253.
(14) Stanley, Bowen, Nash, "Synthetic Lubricating Oil," *Jour. of the Inst. of Petroleum* (1930), p. 830.
(15) Sullivan, Voorhees, Neeley, Shankland, "Synthetic Lubricating Oil," *Ind. and Engr. Chem.*, 23, 604 (June, 1931); F. Sullivan, Jr., *Science of Petroleum*, Vol. IV.
(16) Br.P. 4769 (1877).
(17) Ber. 43, 388 (1910).
(18) Ber. 44, 2978 (1911).
(19) U.S.P. 1309432 (1919); see also U.S.P. 1374277 (1921).
(20) U.S.P. 1350814 (1920).
(21) U.S.P. 1483835 (1924).
(22) U.S.P. 1608329 (1926).
(23) *Brennstoff-Chem.*, 8, 321 (1927).
(24) U.S.P. 1798288 (1931).
(25) "The Synthesis of Lubricants from the Fischer-Tropsch Process," *Petroleum Refiner*, July, 1944.
(26) "Recent Advances in the Manufacture of Synthetic Lubricants from Kogasin," *Petroleum Refiner*, Aug., 1944.
(27) U.S.P. 1850868-9 (1932).
(28) U.S.P. 1878963 (1932).
(29) U.S.P. 1885060 (1932).
(30) Petrov et al., *Jour. Applied Chem.*, U.S.S.R., 5, 790-96 (1932).
(31) Published in U.S.S.R. See 16, nos. 3 and 4 (1943); L. G. Zherdeva, *Neftyanve Khozyaistvo*, 23, 236-42 (1932); ibid, 26, no. 4, 63-65 (1934); Gukhman, *Azerbaidzhamcskoe Neftyanoe Khozyaitvo*, nos. 7 and 8, 117-20 (1934); Petrov, ibid, 5, nos. 6 and 7, 790-96 (1932); Chemozhukov et al., *Foreign Petr. Techn.*, 1, 121-34 (1933); ibid, 2, 21-38 and 39-80 (1934); ibid, 4, 465 (1936); ibid, 5, 422 (1937).
(32) U.S.P. 1893774 (1933).
(33) U.S.P. 1914727 (1933).

Composition of Raffinate and Extract Layers in Selective Solvent Refining

A practical method of mathematical calculation is presented for determining the composition of raffinate and extract layers in selective solvent refining. The method is based on a solubility equation for petroleum products in various solvents which finds a wide application over a range of solvent concentrations and temperatures, and is used in connection with available solvent extraction data. Results on composition of solvent mixtures as calculated by the method described are in general agreement with observed data and that calculated by other methods.

By V. A. Kalichevsky

Consulting Chemical Engineer, Magnolia Petroleum Co.

COMPOSITION of raffinate and extract layers obtained in selective solvent refining is both of practical and theoretical interest. Commercial problems involve computations of equipment sizes and capacities under various conditions of loading. This requires the knowledge of oil and solvent contents of streams entering and leaving the extraction system. Theoretical investigations comprise construction of miscibility diagrams which cannot be accomplished now without expending much time and labor. Lack of generalizations to this effect often prevents efficient utilization of scattered solvent extraction data that are normally available. These considerations stimulated the work described in the present and previous[3] publications dealing with such problems.

The relationship between the quantity of oil dissolved by the solvent (L) and the quantity of solvent employed (S), when both figures are expressed in terms of the volumes of oil charged to the system, was shown[3] to be closely approximated by the following expression:

$$\log L = a \log S + b \quad \ldots\ldots (1)$$

where a and b are constants varying with the nature of oil and solvent, extraction temperature, and method of treatment.

The equation permits estimation of oil distribution between the two phases but not that of the solvent. This limits, to a certain extent, its applicability for solving some of the solvent extraction problems which are encountered in practice. However, the use of the equation may be extended to cover distribution of solvent between the two phases by introducing certain changes in definitions of the variables involved.

In Equation 1, oil is considered as being dissolved by the solvent, and solubility of solvent in oil is related to the quantity of solvent used. However, in attacking the second problem, the solvent must be considered as the solute, and oil as the solvent, thus reversing the normally accepted definitions for the two materials. Under these conditions, a straight line is obtained on a logarithmic paper by plotting the fraction of total solvent employed which is present in the raffinate (S_r) against the oil to solvent ratio (Q). Mathematically, the relationship is expressed as follows:

$$\log S_r = m \log Q + n \quad \ldots\ldots (2)$$

where m and n are constants subject to the same limitations as those applying to the constants of Equation 1.

The use of Equation 2 for solution of practical problems may be visualized from the sample calculations, in Table 1 which are based on experimental data reported by Hunter and Nash.[2] The data refer to three-stage countercurrent extractions of a Mid-Continent lubricating oil stock with various quantities of nitrobenzene at 10° F. Fractions of oil charge dissolved by the solvent (L) and present in the raffinate (Y) are shown in Table 1 and compared with the data calculated by Hunter and Nash (H. and N.) and the method based on Equation 1.

Quantities of solvent and oil present in the extract and raffinate layers are shown in Table 2.

The quantity of solvent based on the oil charge and present in raffinate (x) and extract (y) layers is computed using figures from the seventh column of Table 1 (1-7) and the second column of Table 2 (2-2), and the fourth column of Table 1 (1-4) and the fourth column of Table 2 (2-4) respectively. Calculations are based on the following fundamental relationships:

$$X/[(1\text{-}7)+x] = (2\text{-}2) \quad \ldots\ldots (3)$$

and

$$Y/[(1\text{-}4)+y] = (2\text{-}4) \quad \ldots\ldots (4)$$

Results of these calculations are presented in Table 3.

Figures shown in the first and fourth columns of Table 3 should agree; the discrepancies may be ascribed to experimental errors.

Data presented in Table 3 permit calculations of the relative quantities of solvent found in raffinate and extract layers and based on the total quantity

TABLE 1—Distribution of Oil Between Raffinate and Extract Phases in Three-Stage Counter Current Extractions of a Mid-Continent Lubricating Oil with Nitrobenzene at 10° F.

Solvent (S)	Extract (L) vol./vol. of charge			Raffinate (Y) vol./vol. of charge		
vol. vol. of oil	Obs.	H. and N.	Calc.*	Obs.	H. and N.	Calc.†
0.533	0.452	0.423	0.443	0.548	0.577	0.557
1.000	0.510	0.495	0.520	0.490	0.505	0.480
1.364	0.560	0.525	0.564	0.440	0.475	0.436
1.850	0.623	0.580	0.610	0.377	0.420	0.390
3.750	0.721	0.770	0.731	0.279	0.230	0.269

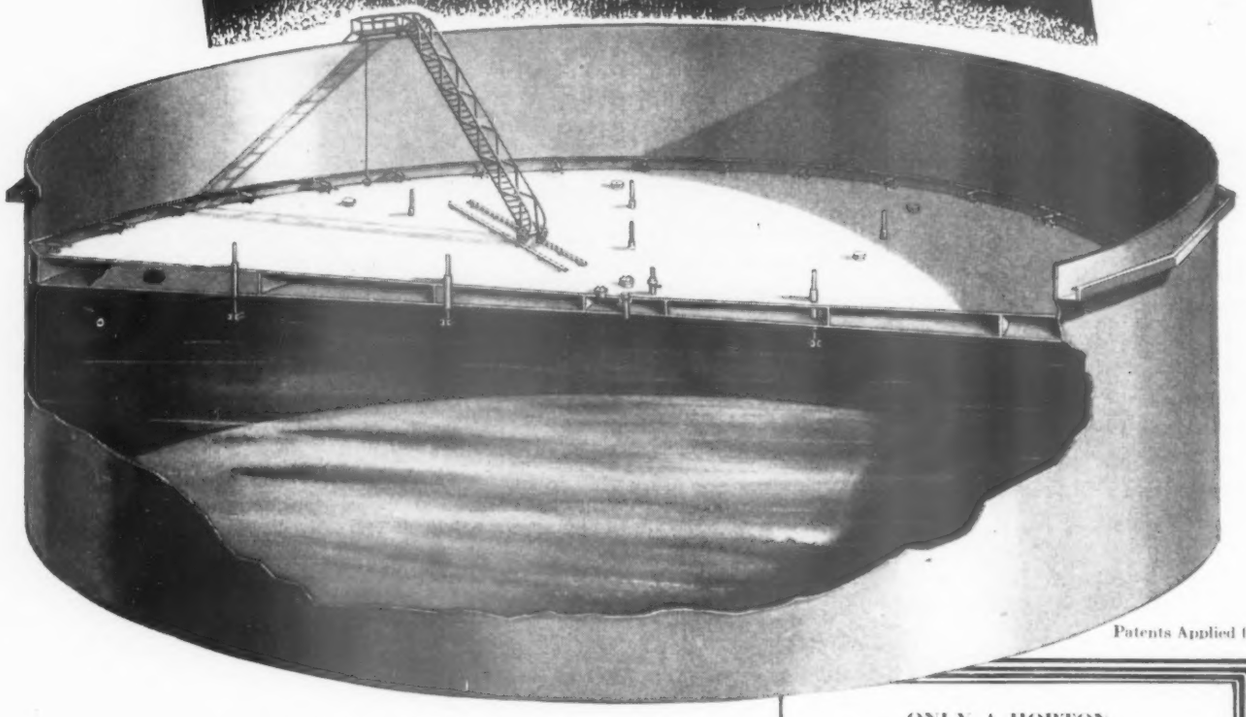
*$\log L = 0.258 \log S - 0.284$. †$Y = 1 - L$.

TABLE 2—Observed Compositions of Raffinate and Extract Layers

Solvent (S)	Raffinate Layer		Extract Layer	
	Solvent	Oil	Solvent	Oil
vol. vol. of oil	%-vol.	%-vol.	%-vol.	%-Vol.
0.533	14.2	85.8	49.8	50.2
1.000	12.5	87.5	64.8	35.2
1.564	10.8	89.2	70.1	29.9
1.850	12.5	87.5	74.3	25.7
3.750	9.0	91.0	83.7	16.3

THE HORTON DOUBLE-DECK FLOATING ROOF

The ONLY floating roof that gives you "double-deck protection" against evaporation over the ENTIRE liquid surface.



Patents Applied for

. . . . provides greater efficiency in preventing evaporation from volatile petroleum products stored in flat-bottom tanks

. . . . reduces fire hazard to a minimum

. . . . lowers maintenance costs

. . . . reduces corrosion on underside of roof

. . . . requires fewer operating costs

The HORTON Double-Deck Roof is built to do a better job in the petroleum industry. It embodies the engineering experience and skill acquired by the Chicago Bridge & Iron Company in designing, fabricating and erecting floating roofs since 1923.

HORTON Double-Deck Roofs may be installed on new or existing flat-bottom tanks whose shells are in good condition. Get the complete story of the HORTON Roof before you install another working tank. Write for Bulletin B.

ONLY A HORTON DOUBLE-DECK FLOATING ROOF GIVES YOU ALL THESE FEATURES

- Double-deck construction insulates the liquid and eliminates practically all boiling. This extends the range of products that can be stored in tanks with floating roofs.
- Bottom of deck is coned upward slightly toward the center so as to vent all air from beneath the deck when tank is first filled. Elimination of air vapor mixture under the roof stops breathing losses and reduces corrosion on the under side of the roof.
- Top deck is smooth, free of obstructions and drains rapidly.
- Roof is designed for a water or snow load of 25 lbs. per sq. ft. and has a buoyancy factor of four to one.
- Water collecting on roof, when center drain is closed, does not reduce stability.

CHICAGO BRIDGE & IRON COMPANY

Birmingham 1	1534 North Fiftieth Street	Chicago 4	2125 McCormick Building
Houston 1	5618 Clinton Drive	San Francisco 11	1260-22 Battery St. Building
Tulsa 3	1607 Hunt Building	Philadelphia 3	1614-1700 Walnut St. Building
New York 6	3345-165 Broadway Building	Los Angeles 14	1422 Wm. Fox Building
Cleveland 15	2206 Guildhall Building	Washington 4	703 Atlantic Building
Atlanta 3	2150 Healey Building	Detroit 26	1513 Lafayette Building

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PENNSYLVANIA

R-614

of solvent used. This is done by dividing the figures in the second and third columns of this table into the figures shown in the fourth column. The results of these divisions are given in Table 4. The table also contains oil to solvent ratios (Q) calculated as reciprocals of solvent to oil ratios (S).

The plot of oil to solvent ratio (Q) against the fraction of total solvent present in the raffinate layer (S_r) will be found to be closely approximated by a straight line on a logarithmic paper, thus satisfying Equation 2. However, it would be noted that the point corresponding to the 0.541 oil-to-solvent ratio is out of alignment. This could be expected, as the experimental data shown in the second column of Table 2 indicate a possible error in its determination.

The problem can be solved algebraically by calculating numerical coefficients for Equation 2 which would satisfy the above relationship. This procedure is described below in detail.

Table 5 shows logarithms corresponding to various oil-to-solvent ratios and fractions of total solvent present in the raffinate layers.

Two experimental points are sufficient for determining numerical values of coefficients in Equation 2. However, four points are available and will be used in further calculations in order to reduce the effect of observational errors. The fifth available point corresponding to an oil to solvent ratio of 0.541 is discarded for the reasons already explained.

The two sets of equations are obtained as follows:

$$-0.762 = 0.273m + n$$
$$-1.174 = 0.000m + n$$
$$-1.936 = 0.273m + 2n \qquad (5)$$

$$-1.409 = -0.135m + n$$
$$-2.194 = -0.573m + n$$
$$-3.603 = -0.708m + 2n \qquad (6)$$

The value of m is determined by subtracting Equation 5 from Equation 6:

$$-3.603 = -0.708m + 2n$$
$$+1.936 = -0.273m - 2n$$
$$-1.667 = -0.981m$$

$$m = -1.667/-0.981 = 1.699$$

The value of n is found by substituting the value of m in either Equation 5 or 6.

$$n = \frac{-1.936 - (0.273 \times 1.699)}{2}$$
$$= -1.200$$

The final equation (substituting in Equation 2) is, therefore,

$$\log S_r = 1.699 \log Q - 1.200 \qquad (7)$$

Comparison between the observed and calculated values is given in Table 6.

For direct comparison of observed data with those calculated by the Hunter and Nash and the present methods, figures shown in Table 6 must be expressed in terms of per cent composition of the individual phases. For the raffinate phase, this is done by dividing calculated values of S_r from Table 6 into the sum of S_r and the product of oil to solvent ratio (Q) and raffinate yield from the seventh

TABLE 3—Solvent Distribution Between Raffinate and Extract Layers

Solvent vol./vol. of oil	Solvent Distribution vol./vol. of oil: Raffinate Layer	Extract Layer	Total
0.533	0.092	0.439	0.531
1.000	0.069	0.957	1.026
1.364	0.053	1.322	1.375
1.850	0.056	1.764	1.820
3.750	0.024	3.754	3.778

TABLE 4—Fractions of Total Solvent Present in Raffinate and Extract Layers

Solvent (S) vol./vol. of oil	Oil (Q) vol./vol. of solvent	Fractions of Total Solvent: Raffinate layer (S_r)	Extract layer (S_e)
0.533	1.876	0.173	0.827
1.000	1.000	0.067	0.933
1.364	0.733	0.039	0.961
1.850	0.541	0.031	0.969
3.750	0.267	0.0064	0.994

TABLE 5—Logarithms of Oil to Solvent Ratios and Fractions of Total Solvent Present in Raffinate Layer

Oil to Solvent Ratio: Q	log Q	Solvent Fraction In Raffinate Layer: S_r	log S_r
1.876	0.273	0.173	—0.762
1.000	0.000	0.067	—1.174
0.733	—0.135	0.039	—1.409
0.541		0.031 (?)	
0.267	—0.573	0.0064	—2.194

TABLE 6—Comparison Between Observed and Calculated Values for Solvent Distribution Between Raffinate and Extract Layers

Oil to Solvent Ratio (Q) vol./vol. of solvent	Solvent Fraction in Raffinate Layer (S_r): Obs.	Calc.*	Solvent Fraction in Extract Layer (S_e): Obs.	Calc†
1.876	0.173	0.184	0.827	0.816
1.000	0.067	0.063	0.933	0.937
0.733	0.039	0.037	0.961	0.963
0.541	0.031 (?)	0.022	0.969	0.978
0.267	0.0064	0.007	0.994	0.993

*From equation 7. †$S_e = 1 - S_r$.

Remler Appointed Agent for

WAR ASSETS Administration

(Under Contract No. 59A-3-48)

. . . to handle and sell a wide variety of

ELECTRONIC EQUIPMENT

released for civilian use

Write for Bulletin Z-1A

Remler Company Ltd.
2105 Bryant St.
San Francisco 10, Calif.

REMLER
SINCE 1918

Radio • Communications
Electronics

The Author

Dr. Kalichevsky

Dr. Vladimir A. Kalichevsky, author of many articles on petroleum, its processes and properties, has been associated with the Oil Industry since his arrival in the United States in 1921. Born 1895 in the Russian oil city of Tiflis in the Caucasus he has lead a very varied and interesting career.

It began at the age of 15 when he became a member of the Russian Corps of Pages, an institution similar to our West Point, from which he was graduated into the armed service of the Russian Emperor.

As Capt. Kalichevsky of the Imperial Guards he distinguished himself by winning trophies and awards for bravery in World War I. With the White Russian Army he took part in the Civil War on the Siberian front in 1919, and later accompanied the Rumanian Mission to Vladivostok and Tokyo.

After the Wars, in 1921, he came to the United States and was granted his citizenship in 1928. Here he realized a youthful ambition to study chemistry and engineering. California Institute of Technology graduated him in 1924 with a Bachelor of Science in Chemical Engineering.

Since receiving his degree, Dr. Kalichevsky has been a research chemist with Union Oil Co. of California, Standard Oil Development Co., and later supervisor of research and development with Socony-Vacuum Oil Co. At present he is the Consulting Engineer at Magnolia Petroleum Co.

In addition to being the author of technical treatises on refining of petroleum products, a few of which have appeared in NPN *Technical Section* and the popular book on petroleum called *The Amazing Petroleum Industry*, the Doctor is also the author of several books in Russian on military tactics.

column of Table 1 (1-7), and multiplying the results by 100. For the extract phase, the same method is used with the exception that S_r is substituted for S_r and extract yields from the fourth column of Table 1 (1-4) for the raffinate yields, i.e.

Raffinate layer

$$\text{Solvent, \%-vol.} = S_r/[Q\text{x}(1\text{-}7)+S_r] \quad (8)$$

Extract layer

$$\text{Solvent, \%-vol.} = S_r/[Q\text{x}(1\text{-}4)+S_r \quad (9)$$

Comparison of observed and calculated figures is given in Table 7.

The tabulated data demonstrate that the agreement between the observed values and those calculated from Equation 7 and the equation given in the footnote of Table 1 is well within the limits of experimental error. It appears also that the results calculated by the present method are considerably closer to the observed data than those calculated by the method of Hunter and Nash.

Experimental data on solvent contents of extract and raffinate layers are very scarce. Table 8 contains some of this information published by Ferris, Birkhimer and Henderson,[1] and compares observed and calculated compositions of the two layers obtained on single stage extractions of lubricating oil stocks. Agreement between the two sets of values appears to be within the limits of experimental error.

Equation 2 may be rewritten employing the relationship

$$Q = 1/S \quad (10)$$

and substituting it into the equation

$$\log S_r = m \log Q + n = m \log (1/S) + n = -m \log S + n \quad (11)$$

Equation 11 has an advantage over Equation 2 because the quantity of solvent employed is normally expressed in volumes of solvent per volume of oil and not in volumes of oil per volume of solvent.

Acknowledgment

The writer would like to express his appreciation to Messrs. J. W. Newton, W. W. Leach, and P. L. Smith for permission to publish this manuscript.

Bibliography

(1) Ferris, S. W., Birkhimer, E. R. and Henderson, L. M., *Ind. Eng. Chem.* 23, 753-61 (1931).

(2) Hunter, T. G. and Nash, A. W., *Ind. Eng. Chem.* 27, 836-45 (1935).

(3) V. A. Kalichevsky, Calculation of Solvent Extraction Equilibria, Amer. Chem. Soc., Atlantic City Meeting, Apr. 8-12, 1946.

TABLE 7—Observed and Calculated Solvent Contents of Raffinate and Extract Layers

Solvent vol./vol. of oil	Raffinate Layer Solvent, %-vol. Obs.	H. and N.	Calc.°	Extract Layer Solvent, %-vol. Obs.	H. and N.	Calc.†
0.533	14.2	14.0	14.9	49.8	51.0	49.5
1.000	12.5	12.5	11.6	64.8	65.0	64.3
1.364	10.8	12.5	10.4	70.1	71.1	68.0
1.850	12.5	13.0	9.4	74.3	75.5	74.8
3.750	9.0	14.5	8.9	83.7	84.0	83.6

°Equations 7 and 8. †Equation 9.

TABLE 8—Single Stage Extractions of Lubricating Oils with Solvents (°)

Solvent vol./vol. oil As appld. (S)	From layer compn.	Raffinate Oil (Y) vol./vol. chg. Obs.	Calc †	Raffinate Solvent fraction Obs.	Calc.‡	Extract Oil (L) vol./vol. chg. Obs.	Calc.†	Extract Solvent fraction Obs.	Calc.
0.55	0.606	0.696	0.579	0.299	0.263	0.304	0.421	0.504	0.449
0.60	0.598	0.590	0.568	0.270	0.253	0.410	0.432	0.481	0.485
0.75	0.747	0.520	0.537	0.233	0.230	0.480	0.463	0.551	0.561
1.00	1.004	0.491	0.492	0.205	0.203	0.502	0.508	0.636	0.604
1.50	1.498	0.408	0.422	0.160	0.174	0.594	0.578	0.705	0.709
2.00	2.116	0.366	0.368	0.149	0.160	0.634	0.632	0.764	0.753
3.00	3.005	0.275	0.280	0.154	0.154	0.725	0.720	0.803	0.804
4.00	3.990	0.217	0.211	0.167	0.159	0.780	0.789	0.835	0.834
6.00	6.051	0.100	0.103	0.218	0.214	0.900	0.897	0.870	0.869

°Experimental data of Ferris, S. W., Birkhimer, E. R. and Henderson, L. M., *Ind. Eng. Chem.* 23, 753-61 (1931)

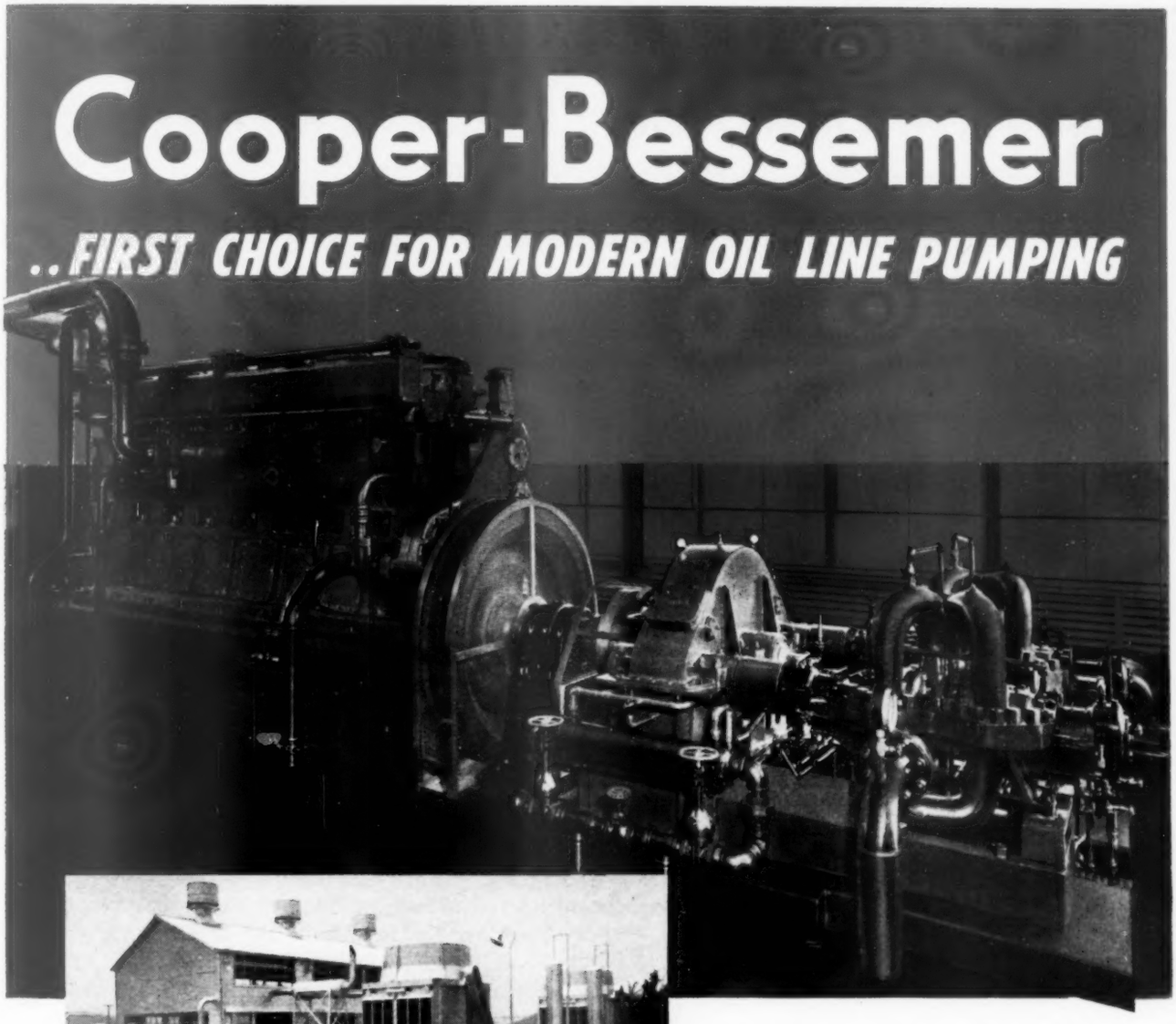
†$\log L = \log (1 - Y) = 0.317 \log S - 0.294$.

‡Solvent fraction $= S_r/(S_r + L)$

$S_r = -1.845 \log S - 0.902$.

Cooper-Bessemer

..FIRST CHOICE FOR MODERN OIL LINE PUMPING



The above engine, installed in a California crude oil pumping station, is a Cooper-Bessemer Type JS 8-cylinder gas engine rated 600 hp at 400 rpm. It is directly connected to a dual pinion speed increaser driving a pair of 4-stage centrifugal pumps. At left is an exterior view of this modern station showing quad radiators, air cleaners and other auxiliary equipment.

The modern installation pictured here, on a major oil company's crude line from Ventura to Los Angeles basin, is perhaps unique on the west coast. Here a Cooper-Bessemer Type JS gas engine is driving a pair of 4-stage centrifugal oil pumps through a dual pinion speed increaser. This rugged engine will give efficient, economical service for years to come and with a very minimum of down-time.

In Cooper-Bessemer Diesels and gas engines you'll find all the modern developments that contribute to long-term satisfaction in heavy-duty service. You'll also find many worthwhile advancements that are available in Cooper-Bessemer engines alone, such as tough, wear-resisting Meehanite Metal, saddle-type piston-pin-to-rod construction, efficient turbu-flow oil cooling of pistons, and many other features that mean the utmost return on your investment dollar.

There is a Cooper-Bessemer office near you, inviting the chance to give you full details on the proper type and size Cooper-Bessemer for your particular service.

THE Cooper-Bessemer CORPORATION

Mt. Vernon, Ohio • Grove City, Pa.

New York, Washington, Bradford, Pa., Parkersburg, W. Va., San Francisco, Cal., Seattle, Wash., Houston, Dallas, Greggton, Pampa and Odessa, Texas, Tulsa, Shreveport, St. Louis, Los Angeles

R-617

Corrosion Limits Metals that Can Be Used For Construction of HF Alkylation Units

To determine the corrosive effects of hydrofluoric acid on metals and which materials are most desirable for the construction of HF alkylation units, Phillips Petroleum Co. conducted a series of extensive pilot plant and laboratory tests.

As a result, corrosion is not now considered a serious problem in HF alkylation, although there are still two unsolved metallurgical difficulties—the blistering of steel and the breakage of bolts, plugs and other fittings.

This article presents a summary of these tests on the corrosion of metals by hydrofluoric acid, and correlates the data with actual experience in commercial operations. Several metallurgical problems that have been encountered, including the two mentioned above, are also included. The material was originally published as Chapter 10 of Phillips' recent book "Hydrofluoric Acid Alkylation" (NPN Technical Section, May 1, '46, p. R-386), and is reproduced here with permission of the copyright owner.

THE DESIRABLE materials of construction for anhydrous HF service are comparatively few. Carbon steel is the basic material and is adequate for pressure vessels up to a temperature of approximately 150° F. Monel or Monel-clad steel is the desirable material for higher temperatures; cupro-nickel might be particularly convenient in heat exchanger tubes. Monel is the desired material for valve trim in severe service, and silver has application in safety heads and other special points. No satisfactory plastic materials are available in commercial scale quantities as yet, for such service as packing and gauge glasses.

Correlation between formal corrosion tests and the actual corrosion observed on commercial plant and laboratory equipment has been good. On the low temperature parts of the equipment in contact with hydrofluoric acid, thickness of scale, machining marks and undulations on the welds all indicate a rate of corrosion not exceeding .01 in. per year. The acid bubble tower, which is in the section handling streams that comprise approximately 100% HF, shows corrosion on steel to be about .03 to .05 in. per year. In all of the equipment in use, no instance of stress corrosion has appeared to date. Pitting has been notably absent on the steel equipment.

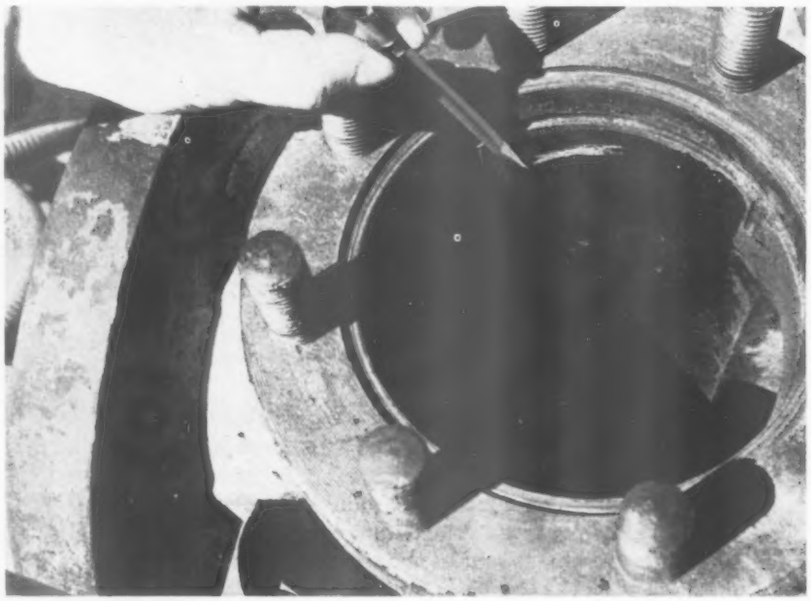
Materials to be avoided can be divided into three classes. The first is made up of straight chrome stainless steels and copper alloys (except cupro-nickel), which are velocity-sensitive in anhydrous HF and in hydrofluoric acid of high concentrations, as in the acid-rerun section. The second class, those which may be attacked by intergranular corrosion, includes Hastelloys A and B, cast iron and high-zinc uninhibited brasses. The third class, materials used for piping and fittings that are brittle or notch-sensitive, includes free-machining steel, high-phosphorus steel and other materials of similar properties.

Variables Influencing Corrosion

Corrosion in HF involves typical oxidation and reduction phenomena. Hydrogen evolution, oxygen and sometimes galvanic currents are involved. In most cases the process seems to be one of reduction of hydrogen to molecular hydrogen, while the fluorine combines with the metal to form metallic fluorides. Hydrogen is observed by the increase in pressure in a closed bomb.

Oxygen greatly increases the corrosion of metals in aqueous hydrofluoric acid. This was disclosed when HF was pressured into the corrosion test chamber with air. Because this should not occur in plant practice, the results of such operation have not been included here. While no clear-cut case of bimetallic corrosion was found in anhydrous HF, galvanic currents may play a large role in corrosion in aqueous hydrofluoric acid.

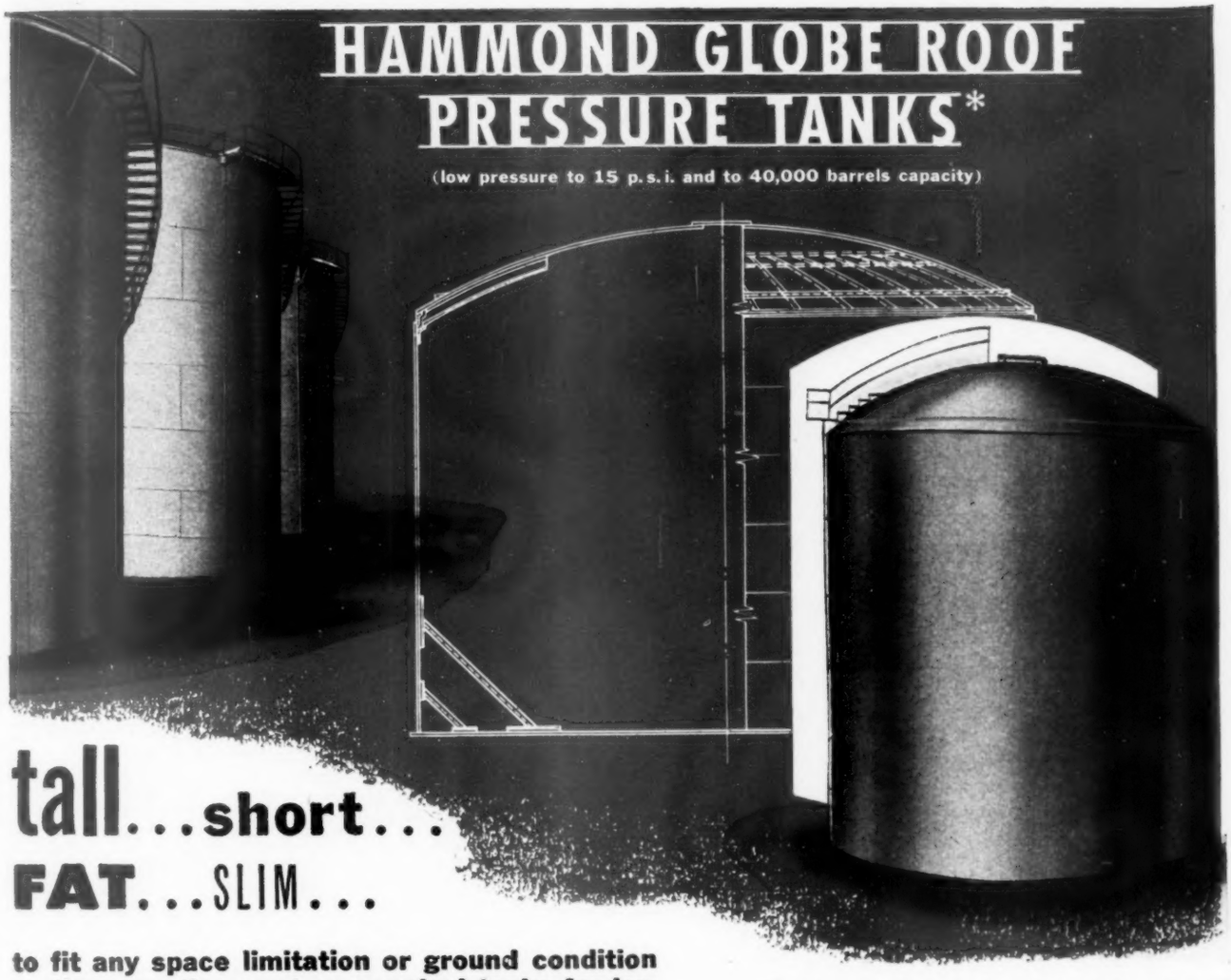
Time plays a vital part in the measurement of HF corrosion rates. All metals



View of scale formation on a valve body. This scale takes the form of a tightly adhering yellowish brittle material, principally iron fluoride. To date no lubricant has been found to eliminate the trouble

HAMMOND GLOBE ROOF PRESSURE TANKS*

(low pressure to 15 p.s.i. and to 40,000 barrels capacity)



tall...short... FAT...SLIM...

to fit any space limitation or ground condition ...they are the most economical tanks for low pressure storage of volatile liquids which boil under normal atmospheric conditions.

Simplicity exemplified is the design and construction of Hammond Globe Roof Pressure Tanks. The roof is self supporting and requires no internal support or bracing. The external ring angle, easily seen in the photograph, together with an internal angle at the top of the shell form a ring girder which prevents the tension forces in the roof plates from pulling the top of the shell plates inward. The bottom of the tank is flat and diagonal ties are provided to balance the upward force in the shell and the downward pressure on the tank bottom.

The flat bottom permits installation on ordinary tank foundations. The factor of safety is greater than required by the A. P. I. Code. The straight shell and flat bottom simplify the calibration and minimize the possibility of error, thus increasing the accuracy of gauging.

Day in and day out the substantial number of Hammond Globe Roof Pressure Tanks, owned and operated by major and independent companies, are demonstrating the efficiency of their design and construction. The tank illustrated paid for itself in three months. Its capacity is 10,000 barrels, operates at a gage pressure of 7½ pounds and is used to store Natural Gasolene. For pressure storage upwards of 15 pounds and to more than 100 p.s.i., Hammond designs and erects Spheres and Bullets to meet specific requirements.

[1] Comparative records of losses of the same product stored in this tank and in other containers of conventional types operating at much lower pressures, indicated that savings during three months of summer storage more than paid for the additional cost of this container over one of the cone-roof type having the same storage capacity.

* PATENTS PENDING

HAMMOND IRON WORKS
Warren, Pa.

NEW YORK • BOSTON • PITTSBURGH • AKRON • DETROIT
CLEVELAND • CINCINNATI • RICHMOND • CHICAGO

HAMMOND designs, fabricates and erects tanks of all types for liquid and dry storage . . . above or below ground . . . high or low pressure . . . cone roof . . . HAMMOND SPHERE . . . floating roof . . . VAPOR-LIFT . . . spheroid . . . GLOBE ROOF PRESSURE . . . gas holder . . . also stainless and stainless-clad vessels of all types and designs for the petro-chemical industries.

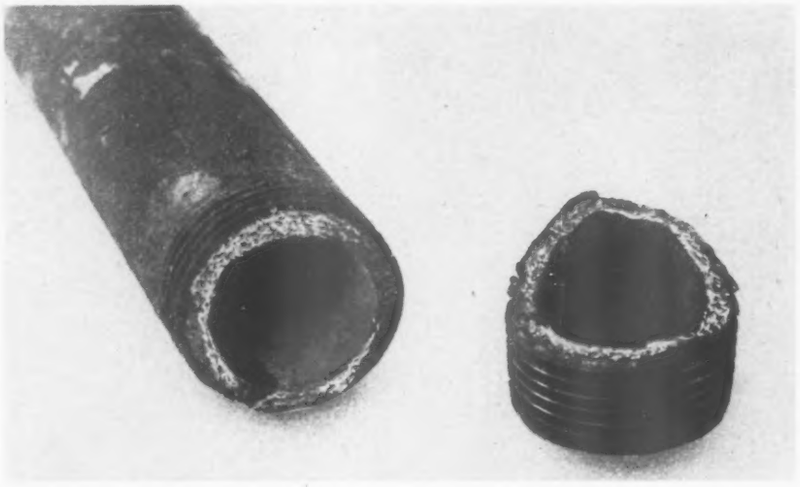
tested in anhydrous HF, with the possible exception of silver, form protective films or scales that decrease the initially high corrosion rates to the low rates observed in commercial use. This means that short time corrosion rates should be discounted, unless the scale formed on the test sample is of appreciable thickness or the validity of short time rates has been confirmed by longer tests. After a scale has formed, diffusion through the scale plays a larger part in the corrosion than the initial rate of reaction of clean metal. When the scale reaches a certain thickness, it begins to flake off and the corrosion approaches a steady rate. In some places the scale on steel forms in layers of the order of .01-in. thickness. In the acid-rerun bubble tower, three to five layers are not uncommon.

The effect of time is noticed in another way. Some materials, for example, aluminum and stainless steels, form a very protective film under atmospheric conditions. When these are subjected to HF, the film protects them for a short while and the true corrosion rate does not appear until the film has been completely penetrated.

Temperature also plays an important part. As temperature increases, the reaction rate likewise increases. But, as pointed out above, diffusion may be a deciding factor in many cases. Steel and copper are particularly affected, and neither material is satisfactory at very high temperatures. The corrosion rates of Monel metal and cupro-nickel also increase with temperature, but not nearly so rapidly as the rates of the above-mentioned materials.

One reassuring point that allows the use of the less resistant materials is the general absence of pitting in anhydrous HF. In the absence of air, only the stainless steels show any tendency toward pitting. This allows the use of steel in such places as the acid-redistillation unit where the corrosion rate is admittedly high (approximately .03 to .05 in. per year on the acid bubble column). Aqueous acid, such as is caused by water being absorbed from air by acid films when vessels are opened for cleaning, may cause pitting and uneven corrosion.

Increase in the velocity of HF streams over the surface of some materials may increase the corrosion rate. The main material of construction, plain carbon steel, is comparatively insensitive to velocity, but materials such as 12-chrome stainless steel and copper are very sensitive. Under these circumstances, laboratory tests with quiet or low-velocity streams need confirmation from plant experience, as may be obtained on pumps, bubble caps and throttling valves.



Several failures at the threaded joints in small size pipe were experienced in early HF installations, such as the broken 1-in. pipe shown above. To minimize these failures, threaded joints are avoided wherever possible, and notch-sensitive materials (such as high-phosphorous or Bessemer steel) are not used

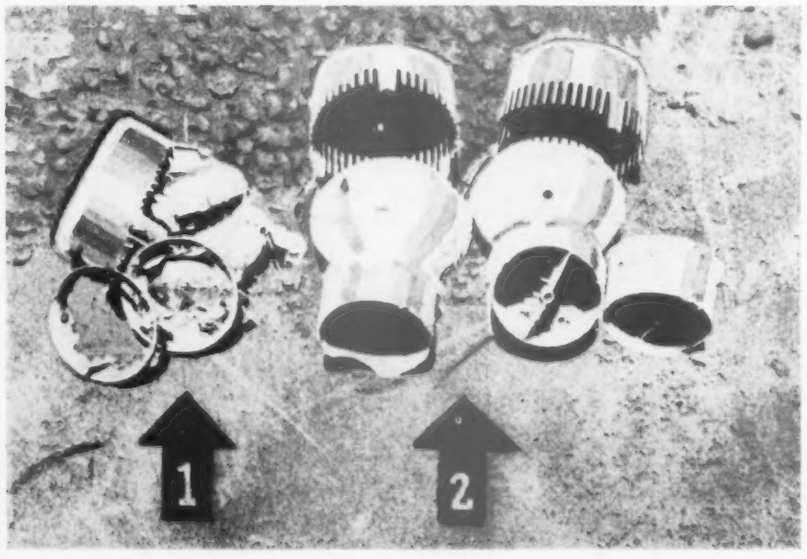
Determining Corrosion Rate

Experiments to determine corrosion resistance were made in several different ways. Early experiments were made in the laboratory using both agitated and unagitated bombs filled with anhydrous HF or various HF hydrocarbon mixtures. The laboratory work demonstrated that corrosion was not affected noticeably by the pressure of moderate amounts of hydrocarbon. Hence correlation of corrosion with the acid-hydrocarbon ratio was not attempted.

Some tests were made in laboratory reactors. In order to confirm data obtained with uninsulated racks, a few tests were made in which the acid dripped over the samples and was thus prevented from forming an electrically conducting continuous phase.

Since no commercial-scale HF alkylation unit had ever been built or operated at the time the Borger unit was designed, a pilot unit for corrosion tests was constructed and was operated about 16 months at both the Borger and Kansas City refineries. This apparatus was used to determine corrosion rates, to find suitable materials of construction, and to check the operating characteristics of valves, pumps, pump packing, etc. This plant gave valuable information as regards corrosion of metals under actual service conditions; for example, impellers in pumps. Results obtained were used in making recommendations as to the ma-

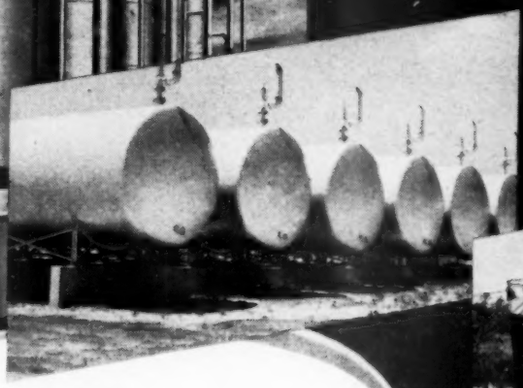
These caps and chimneys were removed from the first bubble tray of an HF acid rerun tower after 17 months operation. The badly corroded caps and chimneys on the left (1) are of carbon steel, the assemblies on the right (2) of Monel



ECONOMICAL · EFFICIENT · DEPENDABLE

WARREN *Stabilized* NATURAL GASOLINE

AND LIQUEFIED PETROLEUM GASES



Because of their plus elements of speed, power and performance, Warren's Stabilized Natural Gasoline and Liquefied Petroleum Gases insure superior products of uniform quality. Because of greatly increased skill, improved equipment and expanded production, Warren's vast network of plants, storage terminals, loading facilities and tank car fleet insure better service and improved delivery. Warren also maintains adequate High Pressure Export Storage Facilities.

Because of these important factors refiners are taking advantage of the opportunity to improve their own products and customer service. You, too, can contribute to the expanding activities and increased tempo of world transportation, industry and agriculture. Warren earnestly invites your inquiries.

NATURAL GASOLINE

Chemical Grade

HYDROCARBONS

Iso-Pentane
Normal Butane
Iso-Butane
Propane
Hexane

STA-VOL-ENE

WARREN PETROLEUM CORPORATION

Manufacturers, Exporters and Marketers of Natural Gasoline and Liquefied Petroleum Gas

Tulsa, Oklahoma

Export Terminals: Corpus Christi, Port Arthur and Norsworthy, Houston, Texas; Lake Charles, La.; and Marcus Hook, Pa.

terials best suited for construction of the Borger and Kansas City units. . . . . .

(A section of the chapter entitled "Results from Pilot Plant" is omitted here. Results from the study of corrosion in equipment and materials in the pilot plant are summarized in the following section.—Editor).

Summary of Results of Experiments

Data from all laboratory and pilot plant tests have been correlated to give best values for rate of corrosion. These data are summarized in Table 1. Since the field test equipment was not set up to maintain a constant temperature, corrosion rates could be obtained only for a range of temperatures. Accordingly, the corrosion results can only be grouped but, within the range of error ordinarily experienced, the data are very consistent. Where only a single temperature is given in the tables, the test temperature was controlled closely.

The corrosion tests present several anomalous results; for example, the data show austenitic stainless steel to decrease in corrosion rate with increasing temperature and experience has shown this to be false. In like manner, tests on magnesium show decreasing rates. It is believed that something in the method of testing has caused these erratic results and that the higher rather than the lower rates should be accepted.

The results of corrosion rate experiments can be divided into two groups: those with essentially anhydrous HF, and those with aqueous hydrofluoric acid of approximately azeotropic composition boiling near 275 to 295° F.

Concentrated HF—These tests were made with varying proportions of HF to hydrocarbon, but in most cases the amount of hydrocarbon was low. Anhydrous acid was charged to the systems, and in many cases there was no possibility of water pickup. The rates for the various materials are given in Table 1. The data included those obtained in the laboratory and pilot plant.

Aqueous Hydrofluoric Acid — These tests were made in aqueous hydrofluoric acid of near azeotropic composition. Because of the difficulty in electrically insulating the samples, most of the tests were made on uninsulated test pieces. Results on the copper alloys were similar to each other, and no particular alloy had any consistent advantage. Hence they are grouped together. Aqueous acid corrosion is encountered during commercial operation only in the lower section of the acid rerun unit. In case of leaks in tube bundles, aqueous acid may be found in the fractionation section of the acid rerun unit.

Air present in the test vessel at the time of charging undoubtedly contributed to the corrosion of the samples. In the 185° F. test, considerable care was taken to purge the system from air.

TABLE 1—Corrosion Rates in Anhydrous HF

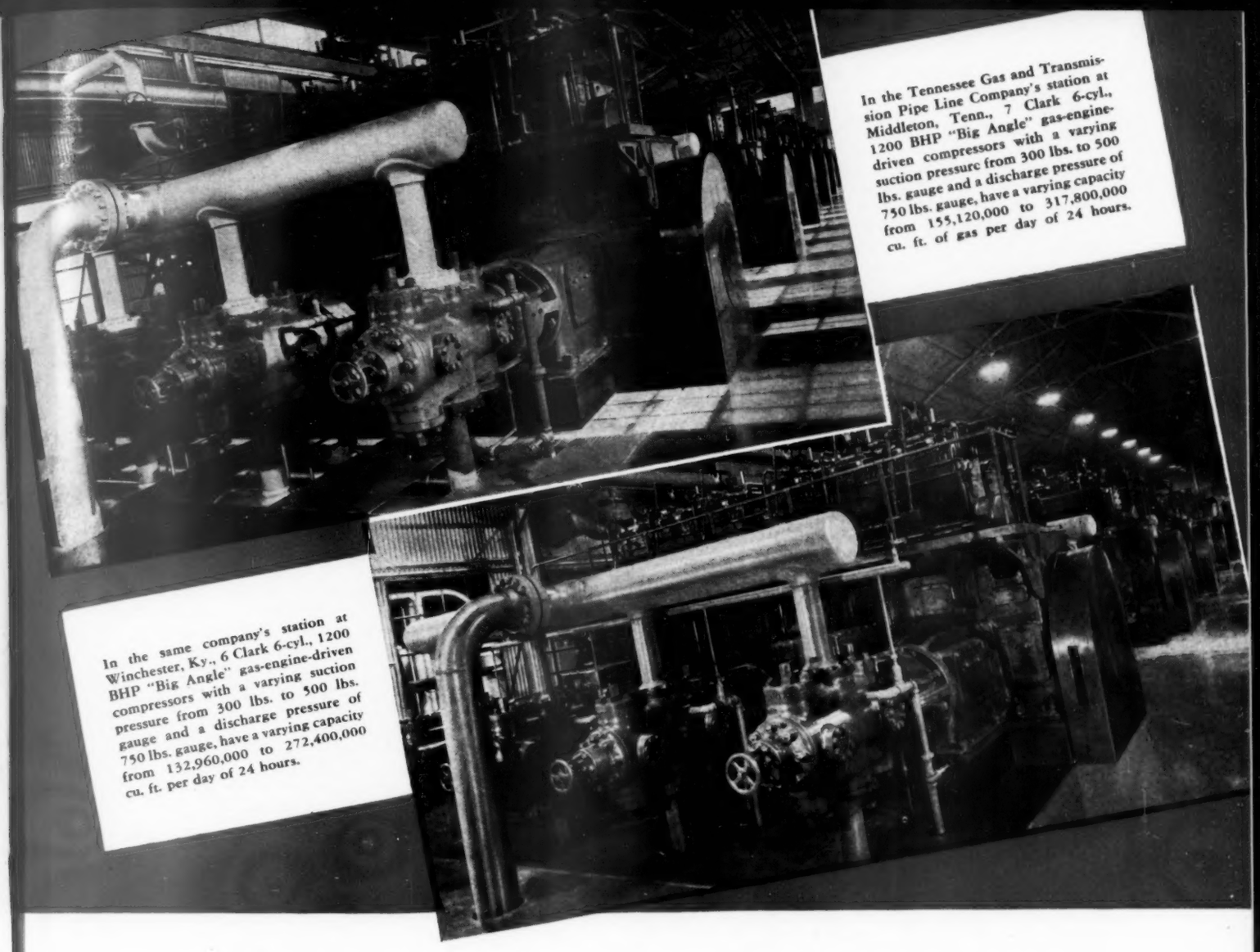
Temperature, °F.	Duration,* days	No. of Tests	Corrosion Rate, inches/year High	Low	Av.
Plain Carbon Steel					
60-80	6-40	5	.0048	.0005	.0028
80-100	14, 33	4	.0083	.0047	.0062
106	7-19	6	.0267	.0070	.0140
130	22, 25	2	.027	.0012	.0140
150	7	3	.0296	.0217	.0247
175	28	1	.048		.048
190	7, 11, 19	3	.129	.066	.089
250-300	7, 21	2	.120	.095	.105
Cast Ferritic Alloy Steels (Includes Cr-1/2Mo, 4140, 2-1/4Cr-1Mo, 5Cr-1/2Mo and 9Cr-Mo.)**					
60-80	15	5	.0072	.0043	.0060
80-100	14	10	.0075	.0029	.0059
106	7, 11	6	.0258	.0071	.0154
190	11	6	.107	.029	.078
Austenitic Stainless (Includes AISI types 302 and 317 and cast 25Cr-12Ni)					
60-80	7-39	7	.0159	.0019	.0062
80-100	14	2	.0054	.0041	.0048
106	9, 19	4	.0129	.0014	.0045
180-190	9-11	5	.0012	.0036	.0024
Ferritic Stainless (Includes 12-chrome and 16-chrome steels)					
60-80	7-39	9	.0208	.0034	.0076
106	9, 19	4	.0050	.0015	.0036
180-190	7	2	.0142	.0032	.0087
Monel (Includes plain Monel and K-Monel)					
60-80	7, 39	4	.0036	.0027	.0032
80-100	8-33	8	.0018	.0003	.0009
100-120	19	1	.0047		.0047
Aluminum					
60-80	6-39	3	.0228	.0176	.0204
190	9	1	.976		.976
Magnesium (Includes Dowmetal E and J)					
60-80	7-39	6	.0199	.0002	.0052
80-100	33	4	.0234	.0118	.0171
130	21	2	.0000	.0000	.0000
160	21	2	.0000	.0000	.0000
Copper					
60-80	7-39	3	.0159	.0106	.0129
Nickel (Includes Z-nickel and plain nickel)					
60-80	8, 10	6	.0037	.0005	.0025
160	21	2	.0044	.0048	.0046
30% Cupro-Nickel (70 Cu, 30 Ni)					
80-100	8-33	7	.0070	.0007	.0020
130	22	1	.0003		.0003
190	8	1	.01		.01
Red Brass (85 Cu, 15 Zn)					
60-80	25	1	.03		.03
80-100	14	2	.0187	.0139	.0163
190	8	1	.05		.05
Antimonial Admiralty (70 Cu, 29 Zn, .97 Sn, .03 Sb)					
60-80	25	1	.01		.01
80-100	14, 33	4	.0188	.0080	.0128
130	22	1	.0004		.0004
190	8	1	.02		.02
Aluminum Bronze (12 Al)					
60-80	7-39	6	.0309	.0060	.0144
Phosphur Bronze (95 Cu, 4.75 Sn, .25P)					
60-80	25	1	.02		.02
80-100	14	2	.0188	.0188	.0188
190	8	1	.06		.06
444 Bronze (88 Cu, 4 Sn, 4 Zn, 4 Pb)					
60-80	25	1	.03		.03
80-100	14	2	.0264	.0183	.0233
190	8	1	.060		.060
Ambrac (5 Zn, 70 Cu, 25 Ni)					
80-100	33	2	.0052	.0051	.0052
20% Cupro-Nickel (80 Cu, 20 Ni)					
80-100	33	2	.0052	.0051	.0052
Inconel (80 Ni, 13 Cr, 6 Fe)					
80-100	33	2	.0028	.0024	.0026
Duriron					
80-100	33	1	.0450		.0450
Durichlor					
80-100	33	1	.0459		.0459

* 6-40 indicates varying times between 6 and 40 days.
14, 33 indicates 14 and 33 days.

** No decided trend was found and hence all are included.

TABLE 2—Corrosion Rates in Aqueous Hydrofluoric Acid

Temperature, °F.	Duration, days	No. of Tests	Corrosion Rate, inches/year High	Low	Av.
Monel					
275-300	7-20	3	.0311	.0276	.0296
Magnesium (Dowmetal E and J)					
185	18	2	.0242	.0210	.0225
140	11	2	.019	.013	.016
Silver					
275-300	21	1			.0033



In the Tennessee Gas and Transmission Pipe Line Company's station at Middleton, Tenn., 7 Clark 6-cyl., 1200 BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge and a discharge pressure of 750 lbs. gauge, have a varying capacity from 155,120,000 to 317,800,000 cu. ft. of gas per day of 24 hours.

In the same company's station at Winchester, Ky., 6 Clark 6-cyl., 1200 BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge and a discharge pressure of 750 lbs. gauge, have a varying capacity from 132,960,000 to 272,400,000 cu. ft. per day of 24 hours.

CLARK "BIG ANGLES"

Serve on the Tennessee Gas and Transmission Pipe Line

Rating 200 brake horsepower per cylinder, the Clark "Big Angle" unit is the most powerful right-angle, gas-engine-driven compressor ever built. It fulfills the industry's demand for greater power in less space and at lower over-all cost.

The extraordinary simplicity and accessibility of this unit result in most economical operation. Ease and speed of maintenance operations, users state, is "simply phenomenal". Vibration is at a minimum.

For high-pressure pipe line pumping and large scale pressure maintenance, the Clark "Big Angle" —BA-17—offers unique advantages. This unit is built in three sizes: 5-cyl., 1000 BHP; 6-cyl., 1200 BHP; 8-cyl., 1600 BHP.

CLARK BROS. CO., INC., OLEAN, NEW YORK

New York · Tulsa · Houston · Chicago · Boston · Washington
Los Angeles · London · Buenos Aires

CLARK

ONE OF THE DRESSER INDUSTRIES

Send for new catalog containing complete specifications and data on the BA-17, including dimensional drawings, also typical installation design for modern pipe line stations.

This test should then be a good measure of the corrosion caused by acid alone.

Eight to 21 day tests on copper, red brass, antimonial Admiralty, cupro-nickel, phosphor bronze and 444 bronze gave rates varying from .0125 to .0250 in. per year at 275 to 300° F., with no particular alloy having any pronounced advantage. These data were confirmed by tensile strip corrosion samples. In all, five tests were made in this range. Three others had to be eliminated because air was used to pressure in the acid and excessively high rates of corrosion resulted.

At 185° F. two tests on copper, red brass, antimonial Admiralty, 30% cupro-nickel, silicon bronze, ambrac and 20% cupro-nickel gave rates varying from .0006 to .0040 in. per year for 18 days. Two 11-day tests at 140° F. gave comparable results. Results on Monel, magnesium and silver are given in Table 2.

Metallurgical Examination

The corrosion rate obtained from weight loss does not always give a complete picture of the phenomena involved. Intergranular corrosion, for instance, may cause the material to lose all of its strength without serious corrosion being perceptible on a weight-loss basis. Further metallurgical examinations are necessary. In these corrosion tests several instances were noted.

Graphitic Corrosion—Several samples of Ni-Resist cast iron exposed to anhydrous HF showed graphitic corrosion—a manifestation of galvanic corrosion in which the graphite is unattacked while the iron is completely corroded. The specimens swelled and cracked but still maintained their identity though the material could be cut with a knife.

Denickelization—A type of corrosion, which may be termed denickelization, occurs on Monel and, to a lesser extent, on cupro-nickel upon exposure to aqueous hydrofluoric acid. Scaly layers on copper in severe cases and thin adherent films in milder cases form on the surface. Some pitting may be present. The most severe denickelization was observed on samples included in tests in which the HF was pressured into the vessel with air. This and other supporting observations lead to the belief that denickelization is occasioned by the presence of oxygen.

Intergranular Corrosion—Samples of Hastelloy A and Hastelloy B exposed to aqueous hydrofluoric acid for three days (HF pressured in with air) suffered severe intergranular corrosion; that is, the grain boundary material corroded away leaving individual grains to drop out. After exposure these particular samples had more the characteristics of a lump of sugar than a piece of metal.

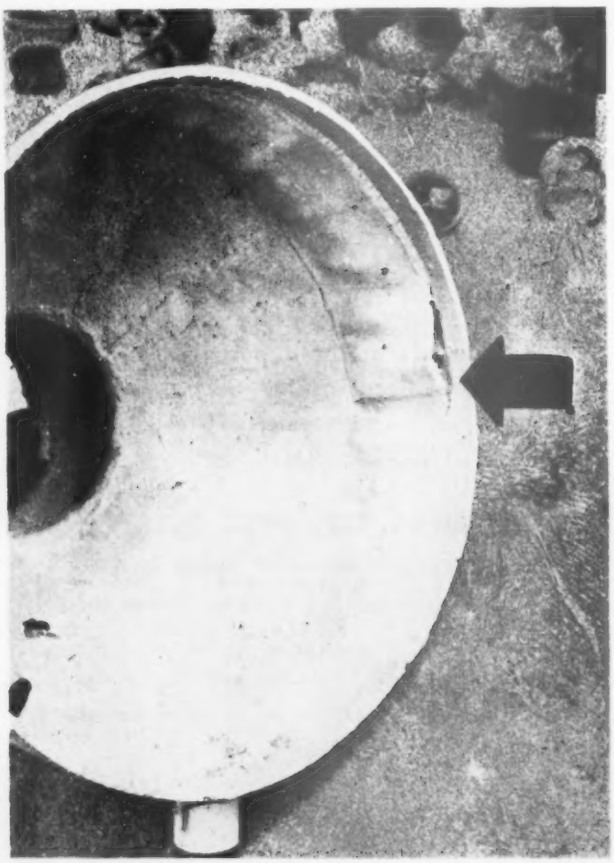
Stress Corrosion—Tests were made to determine whether or not stress corrosion could be induced in low carbon steel and in 18-8 stainless. Pieces pulled in two in tension and then dented with a ball-peen hammer were exposed to anhydrous hydrofluoric acid at 150° F. for one week. This resulted in no intergranular corrosion, nor was the rate of corrosion higher than on the unworked samples. However, in aqueous acid, cold-worked 18-8 did show stress corrosion.

Corrosion in Commercial Equipement

As was to be expected, examination of equipment used in commercial hydrofluoric acid alkylation added much valuable information on corrosion. Frequent inspections were also made on pilot plant equipment used in research on alkylation and any extraordinary occurrences followed in detail.

Effect of Velocity—The experimental units brought out the important fact that 12-chrome stainless was sensitive to the velocity of liquid flow. After four months of anhydrous service at atmospheric temperature, a 12-chrome stainless impeller was badly pitted by cavitation attack. The carbon steel impeller used to replace it was unattacked after longer period of use. This characteristic of 12-chrome material was further confirmed by the rapid corrosion and erosion of 12-chrome discs in gate valves used in the commercial units at Kansas City and Borger and in some motor valves. Hence, it is concluded that 12-chrome stainless is unsatisfactory for HF service because of its sensitivity to velocity.

Copper alloys are similarly unsuited



(Left) Internal view of Monel-lined acid rerun oil leg showing the effects of corrosion taking place behind the lining. Note the distortion of the Monel lining.

(Below) The effect of corrosion on the outer 5/16-in. carbon steel shell of the vessel. The two holes through the shell are due to accelerated corrosion taking place under the Monel lining

EMERY TWITCHELL BASES for Soluble Cutting and Grinding Oils

Emery's Twitchell Bases for Soluble Cutting and Grinding Oils are "made to measure" to "fit" your lubricating oils. They offer definite advantages to both yourself and your customers.

One of these outstanding superiorities is their adjustability. We will "tailor" a base to fit a sample of your oil so that little, if any, adjustment will be required during final compounding in your plant.

Emery's Twitchell Bases 262 and 262-N add a definite rust resistance to your finished oil. Thus you can offer customers efficient protection for machined parts during processing.

Emery's Twitchell Bases contain no volatile ingredients nor corrosive substances. They produce clear oils whose emulsions are stable with little tendency to foam. Chip sedimentation is rapid in grinding oils compounded from either of them. Send sample for "tailor fitting" today.

Write for booklet describing methods of preparing emulsions of all types of lubricating oils with Twitchell Bases 262 and 262N.

LABORATORY CONTROLLED THROUGHOUT PRODUCTION

EMERY INDUSTRIES, Inc.

STEARIC ACID • OLEIC ACID • ANIMAL, VEGETABLE AND FISH OIL FATTY ACIDS
TWITCHELL PRODUCTS • PLASTICIZERS

4300 CAREW TOWER • CINCINNATI 2, OHIO

3002 Woolworth Building, New York 7, N. Y. 187 Perry Street, Lowell, Mass. 401 N. Broad Street, Philadelphia 8, Pa.

ATTENTION ENGINEERS!

Second Printing of Complete Series

PROCESS ENGINEERING DATA

Now Ready in Booklet Form

This series of 7 articles, published exclusively in the TECHNICAL SECTION of National Petroleum News, deals with the development of improved methods of correlating and predicting fundamental physico-chemical data—information important and necessary for efficient design and operation of modern refining plants.

Process Engineering Data was written by Dr. K. M. Watson, (*principal author of the new series on Reactor Design currently appearing in this magazine*) and his associates; the reprint booklet is one of the most widely used pieces of working and reference material we've ever published.

Subjects covered in the series are as follows:

- ***Vapor Pressures and Critical Properties of Organic Compounds***
- ***Thermal Properties of Hydrocarbons***
- ***Thermodynamic Properties of Organic Compounds***
- ***Thermodynamics of Solutions — Ideal Systems at High Pressure***
- ***High Pressure Vapor-Liquid Equilibria***
- ***A Universal Viscosity Correlation***
- ***Pressure Drops in Granular Beds***

Bound in an attractive, durable cover, this time-saving reference booklet contains 48 magazine size pages, complete with tables and illustrations.

PRICE $1.00*

*(Ohio purchasers, add 3% sales tax)

Mail your order today, address:

NATIONAL PETROLEUM NEWS

1213 West Third Street, Cleveland 13, Ohio

for service in high velocity streams of anhydrous HF. Laboratory equipment demonstrated that yellow brass, copper, brazing bronzes, and low-silver silver solders were rapidly corroded away. The Borger acid bubble tower, operating at approximately 150° F., had experimental bubble caps of Monel, silicon bronze and copper. In four months of operation, some of the copper caps had the teeth corroded off. Silicon bronze was also badly corroded but slightly less than the copper. Since the original thickness was .083 in. and the final thickness nil, the corrosion rate was more than 0.12 in. per year. The Monel caps were practically unattacked. The Kansas City plant had a similar experience. The acid bubble tower had one Everdur (silicon bronze) tray, .128-in. thick, with caps of the same material. After approximately 8 months of operation, the caps and trays were almost completely gone.

Still another instance of failure was on antimonial Admiralty used in the second preheater to the acid flash tower at Kansas City. This tower operates at a temperature of approximately 190° F. The tubing was badly pitted in only two months by what was probably a cavitation type of attack.

Cupro-nickel differs from other copper alloys in that it is not similarly affected. This was noted when cupro-nickel was used in conjunction with copper and brazing bronzes. As a result of experience, it can be said that most copper alloys, with the exception of cupro-nickel, are not satisfactory in high velocity streams of anhydrous HF.

Experience With Specific Metals

Yellow Brass—Yellow brass coppertube fittings, which are quite commonly used, are very subject to this type of intergranular corrosion. Cracks appear in a short time after exposure to HF and may appear in as little as one hour when the temperature is raised to 150° F. The remedy is to use a bronze, red brass, or 70Cu-29Zn-1Sn type of brass. These are much less subject to stress cracking.

Comparison of 18-8 Stainless and Plain Carbon Steel—Plant equipment gives some information that indicates the corrosion rates obtained on 18-8 in the laboratory tests to be in error. The 18-8 thermowells at 300° F. in the acid-oil leg of the acid rerun section do not have any longer life than those made of carbon steel. The laboratory tests had indicated that 18-8 was superior to plain steel at elevated temperatures. In the depropanizer overhead condensers, operating at a maximum of 130° F., carbon steel wells of .1-in. wall failed in six months. These were replaced with 18-8 thermowells, and the latest reports indicate that they will last no longer. The corroding agent here may be fluosilicic acid or aqueous hydrofluoric acid. The 18-8 thermowells sometimes show some longitudinal grooving as a result of the corrosion. This grooving probably results from the rolling operating in manufacturing the bar stock.

One place having less corrosion than that predicted by the tests is in the acid-oil leg (at 300° F.) of the acid rerun section. This is thought to be due to the inhibiting action of the oil. Even here the corrosion is not negligible because a heating coil with .13 in. wall corroded through in approximately six months, although corrosion of the vessel wall was at a very low rate.

Monel—Considerable experience has shown that the corrosion of Monel is only slightly increased with increasing temperature in the range 100 to 200° F. The use of Monel in impeller, stators, shafts and laboratory columns has been very satisfactory. The weldability of Monel makes it an easily fabricated nonferrous material.

Plant experience on Monel has been favorable. The acid bubble towers at both Kansas City and Borger are partially lined with Monel. The corrosion was found to be very limited when they were examined at the end of nine and 16 months respectively. Monel trim in motor valves has been satisfactory.

Cupro-Nickel—Laboratory work with cupro-nickel at temperatures up to 200° F. indicates that it will be a satisfactory material for use with HF. Its good resistance to aqueous hydrofluoric acid makes it a desirable material when the service conditions vary from aqueous to anhydrous acid.

Lead—Lead corrodes very rapidly in the anhydrous acid. Its plastic properties, however, make the use of lead gaskets for laboratory equipment convenient. Their use should be restricted to short-time runs, particularly until operators become familiar with its characteristics.

Silver Solders—In direct contact with anhydrous HF, particularly when exposed to high velocity streams, low-silver

Previous Articles on the HF Alkylation Process

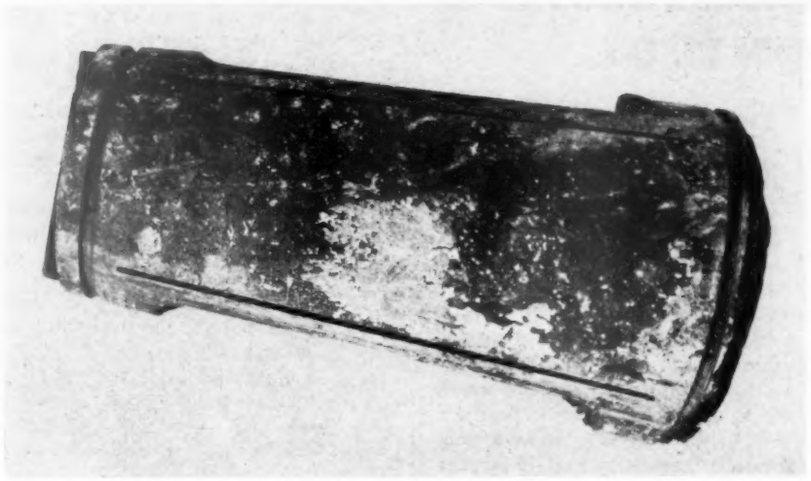
(Published in the NPN *Technical Section*)

"Control Equipment Designed to Withstand HF Corrosion"—Jan. 5, '44, p. R-51.

"Development of the Hydrogen Fluoride, Alkylation Process"—Mar. 1, '44, p. R-146.

"Mechanical Operation of HF Alkylation Units"—May 2, '45, p. R-326.

"Alkylation—Backbone of Aviation Gasoline"—June 6, '45, p. R-407.



Scale formation on valve plugs has been an important factor in plug valve trouble. Its elimination probably lies in the use of Stellite-coated plugs rather than hardened steel

silver solders corrode rapidly. A grade named "Easy-Flo," containing 50% silver, 15½% copper, 16½ zinc and 18% cadmium, is corroded especially rapidly. For exposure to severe service in laboratory equipment, ASTM grade No. 7 silver brazing alloy is used and has proved satisfactory.

Manning, Maxwell & Moore No. 7 Alloy—This alloy, with a nominal chemical composition of 10.0% tin, 5.0% iron, 40% nickel, 0.3% phosphorus, 0.10% silicon and 44.6% copper, failed in ring-joint connections because of its brittleness and notch-sensitivity. Its corrosion resistance in relief valves was adequate.

Notable Phenomena

Two unexplained phenomena have been encountered in HF alkylation.

Blistering — Blisters, presumably caused by hydrogen, were found on the acid settler, azeo feed tank, azeo overhead accumulator and inner contactor shell. These had formed after 16 months of service. The blisters were of various sizes up to 3/4-in. diameter and were under high pressure. The inner contactor liner was the most severely blistered area found.

Breakage of Bolts—Steel bolts holding the inner contactor liner in place at the Borger unit failed after 16 months. In another unit, the lock washers and bolts used in acid pumps failed, usually with more than one crack. Internal springs in small gauge cock valves also failed. Breakage of small parts of plug valves, such as bolts, equalizer rings and plugs has also occurred. This phenomenon is under investigation but the reason is as yet not definitely known.

Other Metallurgical Considerations

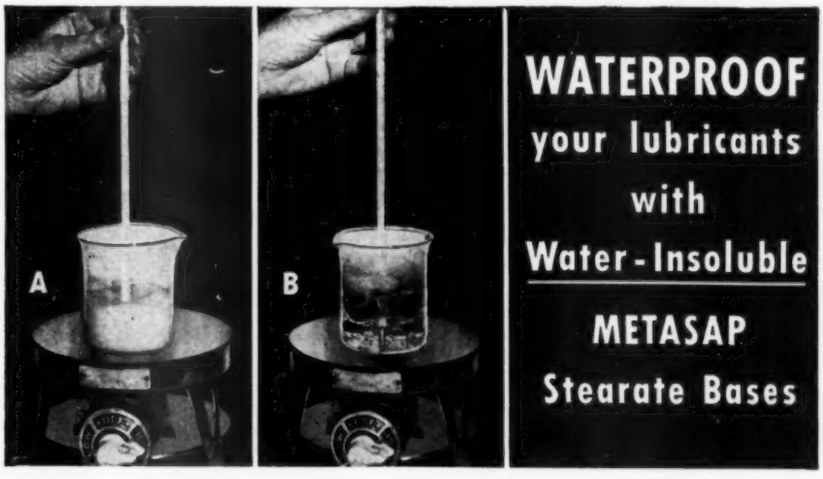
Threaded Pipe—In early laboratory and pilot plant tests, several failures were experienced at the threaded joint in small size pipe. Because of the possible serious consequences of these failures, a thorough study was made. Several factors contributed to the failures. The first was the extremely thin metal section at the root of the last engaged thread in standard weight pipe.

A second factor concerns the impact characteristics of threaded pipe. V-threads present a rather severe notch at their base. This, combined with the thin wall of Schedule 40 pipe, makes it very subject to failure under impact bending loads. Where the force moment is the greatest that is, at the last engaged thread, the pipe is the weakest.

A third cause of failure is the use of notch-sensitive materials like high-phosphorus or Bessemer steels. These may be expected to give trouble, particularly on cold days.

To minimize the failures at threaded joints several things can be done. Wherever possible threaded joints should be avoided; but, if they are required, Schedule 80 or Schedule 160 pipe should be used. In addition, notch-sensitive metals should not be used.

Bull Plugs and Swage Nipples—A problem somewhat similar to that of the threaded pipe is found in connection with the ordinary bull plugs and swage nipples. These, however, are so brittle that the failure is not confined to the threads. More than 10 failures, only two of which were in HF equipment, received attention. In all cases they were made of a high-phosphorus, high-sulphur, free-machining steel, which has very little ductility in the transverse direction. Only forged fittings can be relied



Recent tests show (Photograph A) that *water-soluble* soda grease bases are highly susceptible to emulsification by moisture; and (Photograph B) that *water insoluble* Metasap Stearate Bases are, on the other hand, extremely moisture-resistant. Lubricants made with Metasap do not emulsify even when exposed to pelting rain or puddle splashes. Metasap Stearate Bases won't separate, bleed, evaporate or freeze. Metasap helps produce crystal-clear lubricants with less base and more mineral oil—*the true lubricating ingredient*. Any body desired from stiff, short-feathered grease to thin fluid lubricant. Write for more complete information.

METASAP CHEMICAL COMPANY, HARRISON, N. J.
CHICAGO • CEDARTOWN, GA. • BOSTON • RICHMOND, CALIF.
A Division of National Oil Products Company

METASAP CHEMICAL COMPANY
REG. U. S. PAT. OFF.

Stearates
of Aluminum · Calcium · Lead · Zinc

REFINING • LUBRICANTS
PROCESS CONTROL

Add these Latest Books to
Your Library of Valuable Technical Information

American Petroleum Refining *{By H. S. Bell}*

Contains *all* the most up-to-date developments in petroleum technology . . . From the crude storage tank to the finished product, *every step* in modern refinery engineering and operation is *given in full* . . . The methods of calculation of the chemical, physical and engineering data needed in practical design are fully explained, with the information arranged in hundreds of comprehensive tables and graphs, and with sample problems to show every step in practical applications. Photographs and diagrams illustrate refinery construction. Included are flow sheets of processes and details of apparatus. Each important class of refinery equipment is the subject of an entire chapter which covers its design from the basic principles and calculations down to the details of construction . . . . . 640 pages, Illustrated and Indexed, $7.50

Lubricants and Cutting Oils for Machine Tools *{By W. G. Forbes}*

Covers the fundamentals of lubrication and the application of numerous types of cutting oils in relation to machine tool operations . . . Discusses the various properties of lubricating and machine oils, their relative importance, and methods of testing, as well as their composition, compounds and blends . . . Suggests points to be covered when specifying lubricating and cutting oils . . . Deals with lubricating greases. Gives practical applications of cutting oils . . . Prescribes treatment and offers suggestions for the prevention of skin diseases resulting from contact with lubricants . . . . . 90 pages, $1.75

Lubrication of Industrial and Marine Machinery *{By W. G. Forbes}*

Discusses principles of lubrication for common types of engines and machines; with descriptions, explanations and analyzations of everyday lubrication problems. Covers mechanics of lubrication, fundamentals of production, tests and specifications for lubricating oils, and methods of applying lubricants, 314 pages, $4.00

Instruments and Process Control *{By R. E. Clarridge, J. S. Detwiler, G. E. Heller, R. N. Pond and B. C. Delahooke}*

Written in layman's language, this monograph was prepared in the Curriculum Laboratory at Cornell University in cooperation with the Taylor Instrument Company . . . Explains industrial processes and the measurement and control of their variables . . . Defines common instrument terminology . . . Discusses basic control theory, simple controllers, controller mechanisms, and the applications of controllers . . . Contains over 200 illustrations, photos and drawings . . . Well prepared and easy to read . . . . . Reproductions of 233 typewritten pages 8½ x 11, paper cover and plastic bound, $2.75

A. S. T. M. Standards on Petroleum Products and Lubricants *{1945}*

Contains 80 standard and 5 emergency standard methods of test; 11 standard and 2 emergency specifications and 3 standard definitions. Covers gasoline, fuel oils, Stoddard solvent, cut-back and emulsified asphalt (several grades of each) mineral spirits and thermometers . . . Appendices show the results of tests on the development of a method for estimating maximum pour points of lubricating oils containing pour point depressants . . . and the proposed method of test for such pour points . . . also the proposed method of test for total olefinic and aromatic hydrocarbons in gasoline . . . 546 pages, $2.75

Mail your order for the above books to:

NATIONAL PETROLEUM NEWS
1213 WEST THIRD STREET • CLEVELAND 13, OHIO

R-628

on. This has necessitated the use of AISI 1020 steel fittings made specially, or of those made at the refinery. It should be pointed out that brittle fittings are dangerous, not only in HF equipment but elsewhere in a refinery.

A simple test will distinguish between the good quality and extremely bad fittings. A ring cut from the free machining fittings will snap after only a small amount of flattening and practically no elongation. A good quality steel, such as is found in seamless pipe, will crush almost completely; and the steel will tear rather than snap.

Butt-Welded Pipe—Two failures have occurred in butt-welded pipe in experimental work. One was in a 2-in. diameter bomb which burst at moderate pressure; the second was in a ¼-in. standard weight nipple. From these and other observations on the erratic quality of welded pipe, it was concluded that seamless pipe should be used exclusively in HF service.

Safety Heads—Safety heads (under relief valves) of copper and silver tend to elongate by creep and eventually to fail. Attempts are being made to get heads of cupro-nickel. The resistance of silver to HF is very good but in the presence of appreciable amounts of sulfur, it might give trouble. Gold-plated discs could possibly be used to resist sulfur.

Copper Welds—Welds in deoxidized copper plate made with copper rod were not satisfactory. After exposure to the acid, the inclusions in the weld metal were corroded out and, as a result, left a porous weld.

Plug Valves—Plugs of Merco Hypreseal valves have failed in some cases by shattering and cracking. Cover plate studs and equalizer rings in these valves have also been subject to breakage. Metallurgical examination showed that these plugs were made of a deep-hardening steel with considerable variation in hardness due to extensive segregations. The mechanism of these breakages is still unknown, but, in general, it is believed that hardened steel should not be used for plugs in HF service. Stellite-coated plugs appear to be the best solution to the problem, no example of failure of a Stellited plug having ever been encountered. The use of a heat-treated "K" Monel stud is considered the most certain way to avoid stud breakage.

Conclusions

Corrosion is not considered a serious problem in HF alkylation. There are two main metallurgical problems which await solution. These are the blistering of steels and the breakage of bolts, plugs etc. in concentrated hydrofluoric acid service. One possible explanation of both phenomena is that of "hydrogen embrittlement." However, some of the known facts do not agree with this mechanism. Until further investigations have been completed, these two phenomena must be considered as unexplained.

Principles of

REACTOR DESIGN

ARTICLE No. 4 in a Series—

Toluene from Benzene plus Xylenes

By L. N. JOHANSON and

K. M. WATSON

University of Wisconsin, Madison

A laboratory-scale investigation was made of the production of toluene by methyl-group transfer and disproportionation in an equimolal mixture of benzene and xylenes over a silica-alumina cracking catalyst. It was found that the rate of reaction increases rapidly with increased pressure at low pressures but is little affected by further increase above 300 psi. Increased temperature increases the rate of reaction at high pressures up to approximately 1000° F, beyond which the rate is reduced by increased temperature except for very short process periods.

At all conditions investigated the catalyst was subject to rapid fouling by carbonaceous deposits, which were removed by periodic oxidation with air. Feasible commercial operating conditions are a liquid hourly space velocity of 0.7 at a temperature of 900-950° F, a gage pressure of 150 psi, and a process period length of 15 min., followed by complete oxidation of the catalyst deposit. Operation at these conditions should yield approximately 25-30% toluene per pass.

Accurate estimation of ultimate yields in a recycling operation is not possible from the data obtained. No gaseous products result from the reaction but the carbon content of the catalyst deposit corresponds to roughly 10% by weight of the toluene produced. On this basis ultimate yields of the order of 70-80% might be expected. Due to disproportionation of xylene to form toluene and trimethyl benzene, the consumption of xylene probably exceeds that of benzene.

The data obtained are consistent with a catalytic mechanism in which the rate is controlled by a surface reaction between adjacently absorbed benzene and xylene molecules. A rate equation was developed on this basis which satisfactorily represents the data and is believed reliable for design at conditions not far distant from the experimental range. Complete verification of the mechanism and development of rigorous rate equations to take into account the several individual reactions involved will require additional data.

THE literature covering early work on the transfer of alkyl groups among aromatic compounds has been reviewed recently by Hansford, Myers and Sachanen.[3] As early as 1886 it was recognized that in the presence of aluminum chloride polyalkyl benzenes undergo disproportionation reactions to form simultaneously monoalkyl and more highly alkylated benzenes. Thus, xylene gave a mixture of toluene and trimethylbenzenes. Similarly, a dialkyl benzene such as xylene was found to react with benzene to form the monoalkyl product.

Hansford, Myers and Sachanen[3] studied reactions of this type at an absolute pressure of two atmospheres and temperatures of 454-538° C (850-1000° F) in the presence of a silica-alumina cracking catalyst. It was found that alkyl group transfer was obtained between benzene and xylene, pseudo cumene, and diethylbenzene. Rates of reaction were low and the estimated equilibrium conversions were not closely approached at the most severe conditions employed. No toluene was obtained from α-methyl naphthalene and benzene but there was evidence of the formation of naphthalene and polymethyl naphthalenes by disproportionation.

It was found that xylene when processed alone under similar conditions underwent disproportionation to produce approximately equimolal quantities of toluene and trimethyl benzene. A run made on an equimolal mixture of xylene and benzene at 1000° F indicates that toluene was produced at approximately equal rates by the disproportionation of xylene and by the transfer of a methyl group from xylene to benzene. Similar data on mixtures of diethyl benzene and xylene indicate that the relative extent of the disproportionation reaction is increased by increased temperature. At a temperature of 850° F the reaction was largely one of ethyl group transfer to benzene, while at 1000° F disproportionation to form mono-ethyl benzene, without consumption of benzene, predominated.

The present investigation was carried out independently in 1943-1944 under the sponsorship of the Office of Production Research and Development of the War Production Board to explore the possibility of emergency production of toluene from benzene and xylene. The work differs from that of Hansford, Myers and Sachanen principally in the wide ranges of operating conditions which were covered in order to develop a basis for commercial evaluation and design. The analytical data were less complete and reliable and for the most part were limited to evaluation of the toluene content of the product. Since increased pressure was found to be very beneficial, most of the work was carried out at pressures of 100-450 psi. In all cases the feed stock was an equimolal mixture of benzene and commercial xylenes.

Apparatus

A flow diagram of the small pilot-plant used for the catalytic tests is shown in Fig. 1. Pairs of calibrated feed tanks of two different diameters are used to contain the benzene-xylene feed under atmospheric pressure. The feed is pumped by a proportioning pump having two plungers whose strokes can be independently adjusted. By use of one or two plungers and adjustment of stroke, wide ranges of feed rates may be obtained. However, at very low feed rates the valves of the pump did not satisfactorily maintain a constant rate of discharge and it was necessary to operate the pump at a higher rate with a by-pass from discharge to suction for flow control. In the by-pass line is a specially constructed needle valve having a small-diameter seat with a long taper and fine thread on the stem.

Pulsations from the pump are damped by a high-pressure surge chamber which is provided with a reflex type gage glass and filled with nitrogen. From the surge chamber the feed

passes to a flow meter comprising a high-pressure mercury manometer of the tubular form connected across a steel orifice housing. Instead of a thin plate orifice it was found desirable to use a glass capillary for the small rates of liquid flow employed. Capillaries of various capacities were prepared by drawing 6-mm. glass tubing to a fine capillary and successively breaking off sections of the tip until the desired capacity was obtained.

The reactor pressure is indicated by a gage mounted at the outlet of the flow meter. The reactor is protected from excessive pressures by a rupture disk which is relieved to a stack. The reactor and feed systems are designed for a working pressure of 600 psi at a catalyst temperature of 1000° F. The rupture disk is set to fail at 1000 psi.

After passing through the reactor the products are reduced in pressure by a needle valve of the type previously described and cooled in a water condenser at atmospheric pressure. A glass receiver serves to collect the liquid and separate the gaseous products for measurement in a gasometer. Since in this work no appreciable gas production was observed at any conditions, no gas handling equipment is shown on the diagram.

The reactor is provided with a connection for purging with nitrogen and regenerating the catalyst with air. The rate of air flow is indicated by an orifice meter and manually controlled by a needle valve. The gases from the reactor during the regeneration period together with an excess of air are passed through an electrically heated tube of copper oxide to ensure oxidation of all carbon to the dioxide. The total carbon dioxide formed is determined by three wash bottles in series, each containing a standard solution of potassium hydroxide. The first two wash bottles are of the spiral path type, 10 in. high. With this arrangement little or no carbon dioxide reached the third wash bottle, which is a spiral type 5 in. high.

Details of the reactor and preheater assembly are shown in Fig. 2. The catalyst bed and preheater are combined in a 1-in. standard pipe-size tube of 18-8 steel provided with a flanged connection at each end. The hydrocarbon feed is introduced at the top in the annular space surrounding a core of mild steel. This core is machined with a helical groove such that the lands fit closely inside the reactor tube. As a result the hydrocarbon feed passes at relatively high velocity over the walls of the heated tube and is effectively preheated with only a small volume in which pyrolytic decomposition can occur. The lands are removed from the lower section of the core to provide an equalizing space from which four holes direct the feed to the center of the tube. A thermocouple extending through the center of the core indicates the temperature of the material entering the catalyst bed.

The catalyst bed is supported by a screen of 18-8 steel which is carried by the protection tubes of two thermocouples. These thermocouples indicate the temperatures of the bottom of the catalyst bed at the center and near the tube wall. The depth of the catalyst bed may be varied by changing the lengths of the supporting thermowells. In some experiments at low space velocities the space below the catalyst bed was filled by a close-fitting steel core to reduce time lag in the collection of the products. The reaction products passed around the thermowells in a slot cut two-thirds of the way through this core.

The tube containing the preheater and catalyst bed is surrounded by an aluminum bronze block to ensure temperature uniformity. This block is divided into upper and lower sections by a deep groove to minimize heat transfer between the preheat and reactor zones. The two sections of the block are heated by wire-wound electrical heating units each having a capacity of 3 KW on 220 volts. Automatic control of the block temperatures is obtained by on-and-off operation of the heating elements by relays which are energized by the microswitches shown in the diagram. Each microswitch is operated by the differential expansion between the aluminum bronze block and a fused silica rod inserted in a hole drilled approximately half the length of the block. The temperature at which the block is controlled is adjusted by a screw in the lever connecting the rod to the microswitch. If the temperature rises above the control point the aluminum bronze block is lengthened relative to the silica rod, the microswitch is opened and the power turned off. In this manner a temperature can be maintained with periodic variations of the order of ±2° C if the impressed voltage is adjusted to give only a moderate heating rate at the control temperature. The heating elements are surrounded by insulation encased in a section of Transite pipe which is supported on a tripod base to stand on a laboratory bench.

Operation

The catalyst bed used in all runs comprised 85 g. (135 cc.) of Houdry silica-alumina cracking catalyst supplied by the Catalytic Development Co. The catalyst was in the form of ⅛ x ⅛ in. cylinders. Three different batches of catalyst from the same lot were used, each of which was aged by a few cycles of operation before data were taken. The activity of the catalyst was periodically checked by a run at

Fig. 2—Details of Catalytic Reactor

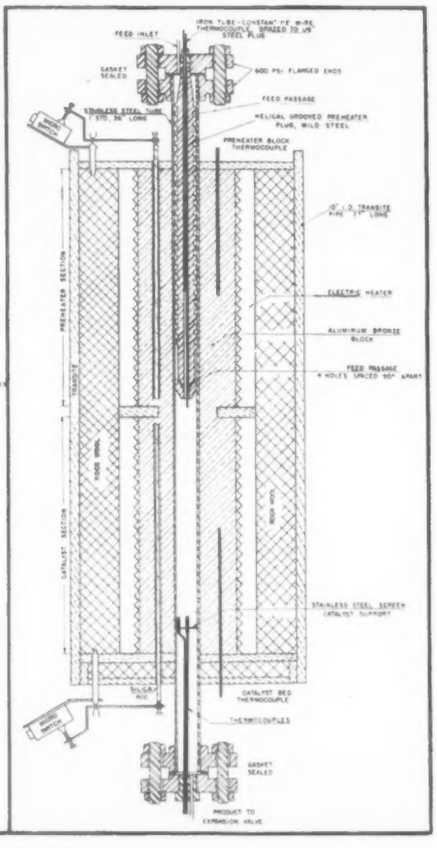
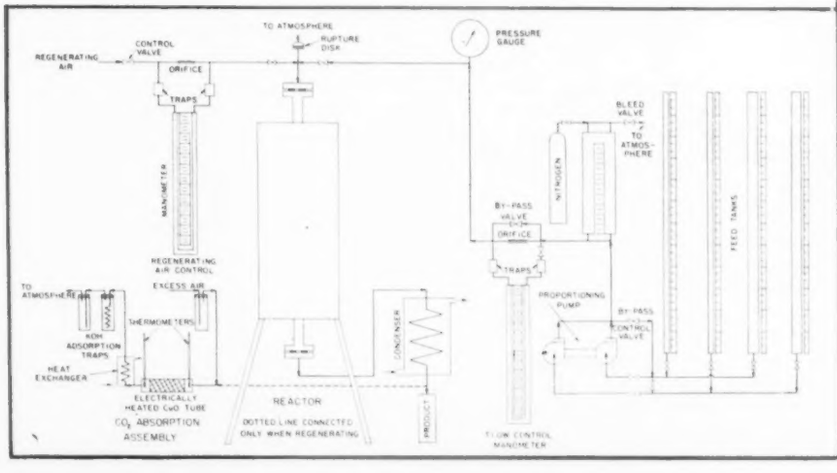
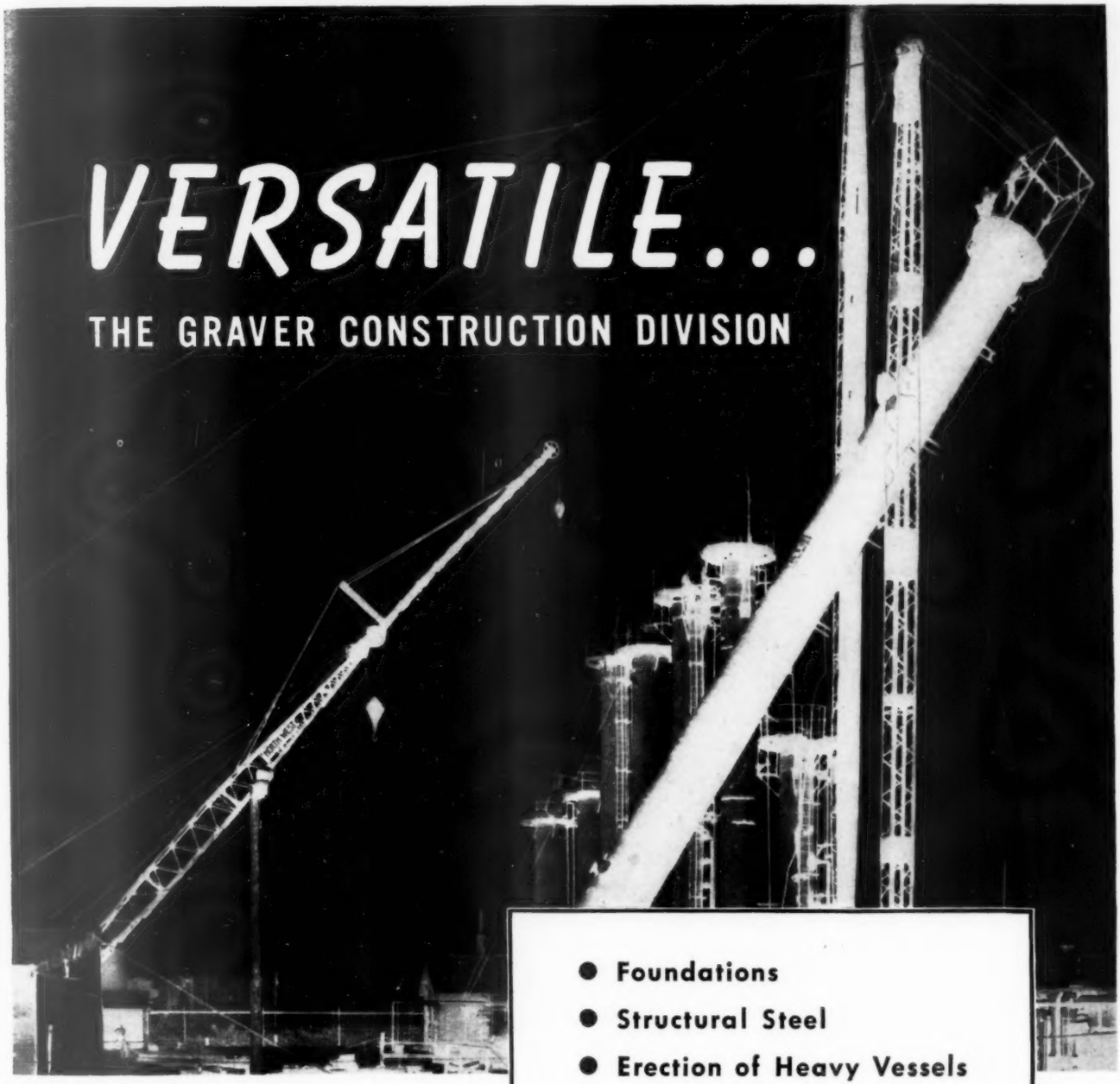


Fig. 1—Flow Diagram of Catalytic Pilot Plant





VERSATILE...

THE GRAVER CONSTRUCTION DIVISION

- Foundations
- Structural Steel
- Erection of Heavy Vessels
- Piping
- Brick Work
- Equipment Setting
- Electrical Installations

Graver maintains the men and equipment to do the entire construction job to your specifications and to your complete satisfaction.

GRAVER CONSTRUCTION DIVISION

Construction Division of

GRAVER TANK & MFG. CO., INC.

4811-19 Tod Ave., East Chicago, Indiana

NEW YORK CATASAUQUA, PA. CHICAGO PITTSBURGH, PA.
SAND SPRINGS, OKLA. PHILADELPHIA, PA. PORT ARTHUR, TEX.

R-631

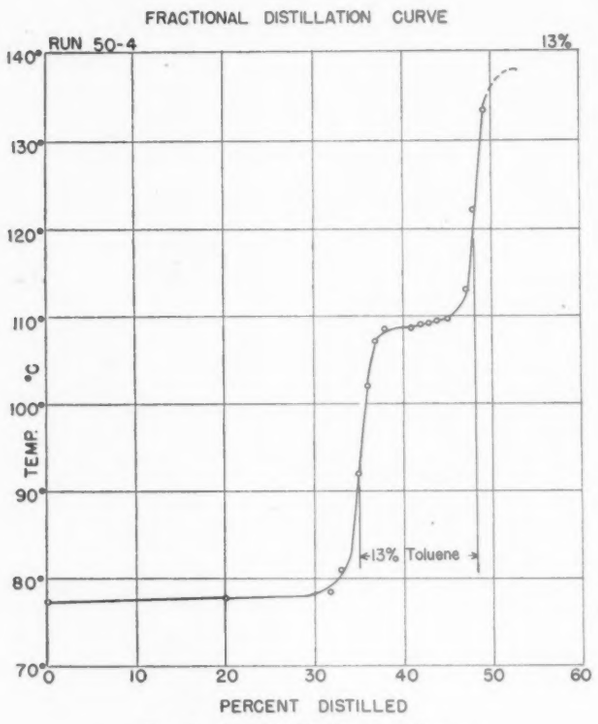


Fig. 3—Sample Distillation Curve

arbitrarily selected conditions for comparison to earlier similar runs.

In starting a run the reactor assembly was purged with nitrogen and heated to the desired constant temperature. Hydrocarbon feed was then introduced at the desired rate and the reactor outlet valve kept closed until pressure was built up to the desired value. The feed rate and pressure were then held constant by manual operation of the reactor outlet and inlet valves and the pump by-pass.

Because of the considerable volume of the outlet lines and the free space in the reactor there was a long lag at low space velocities between the time of feed introduction and the appearance of the first product. It developed that this time lag is of major importance because of the rapid loss in activity of the catalyst at the start of each process period. For this reason the time of appearance of the first product was carefully noted in order to establish $\Delta\tau$, the time between the introduction of feed and the appearance of products. When a sample of products was collected, the corresponding length of the process period at the mid-time of collection was taken as the difference between the time from the start of the run and $\Delta\tau$. This difference represents the average time during which the catalyst had been in contact with hydrocarbons when the feed-stock corresponding to the sample entered the reactor. Ordinarily the collection of samples for analysis was started with the first appearance of product. Successive samples of 50-100 cc. of product were collected throughout each run in order to follow the rate of decline in activity of the catalyst with fouling. Readings of temperatures, pressure and feed-rate were recorded at approximately ten minute intervals and averaged to correspond to the periods of sample collection.

The samples were analyzed by distillation either in an adiabatic column ⅜ in. in diameter and 72 in. high packed with ⅛ in. single turn helices or in a vacuum-jacketed high-temperature Podbielniak column having a diameter of 13 mm. and a height of 72 in. Because of the relatively small samples which were required in order to follow the decline in catalyst activity the accuracy of the analyses was low. Probable error in the determination of toluene was approximately ±2%. For example, in the helix packed column 5-7 ml. of distillate were collected while the temperature was rising from one plateau to the next. Where a well defined toluene plateau was obtained, the toluene content was taken as the distillate collected between the midpoints of the rising sections of the distillation curve between the benzene-toluene and the toluene-xylene plateaus. A sample distillation curve is shown in Fig. 3. This procedure was unsatisfactory for samples so low in toluene content that the plateau was poorly defined. Where no plateau was found the toluene content was reported as zero and in dealing with samples low in toluene the mid-points between the plateaus were arbitrarily shifted toward the toluene plateau to offset the too-high values otherwise obtained.

Attempts to use ultraviolet spectrophotometry as reported

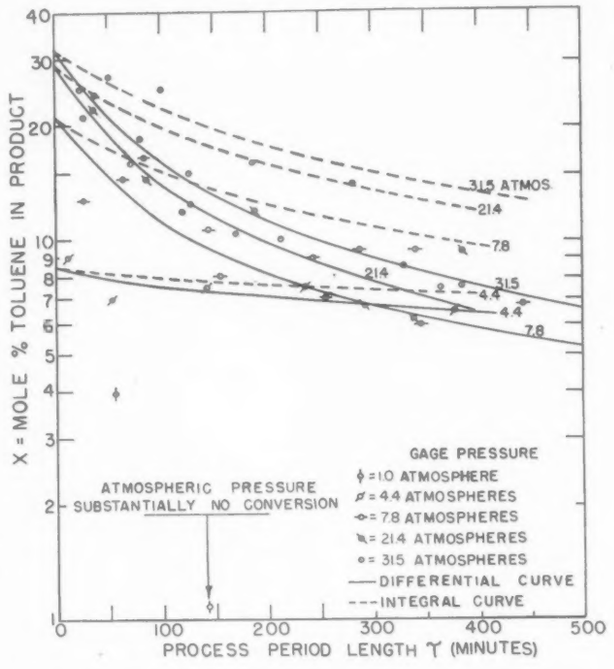


Fig. 4—Effect of Process Period Length at Various Pressures (t=932° F; S_1=1.0)

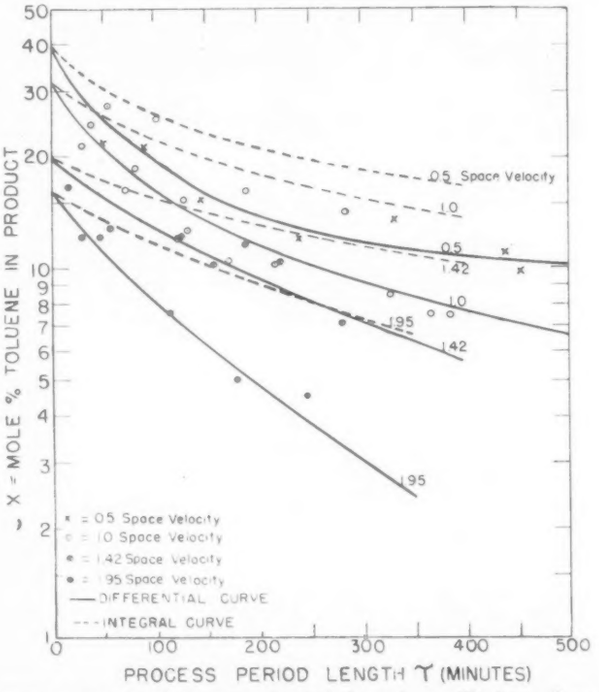


Fig. 5—Effect of Process Period Length at Various Space Velocities (t=932° F; π=31.5 atms.)

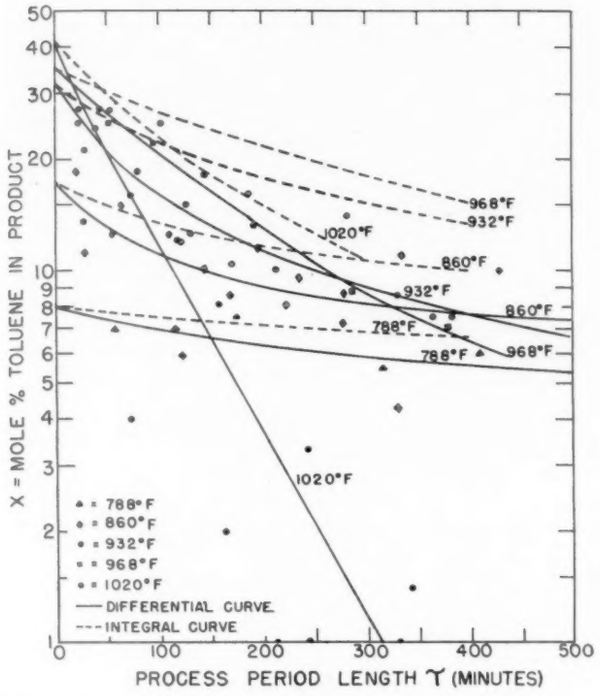


Fig. 6—Effect of Process Period Length at Various Temperatures ($S_1 = 1.0$; $\pi = 31.2$ atms.)

by Reiser and Watson[6] for analysis of samples low in toluene were unsuccessful chiefly because of the presence of some ethyl benzene in the xylene used. The ultraviolet absorption curve of ethyl benzene is similar to that of toluene and separate determination of the two compounds in the presence of each other is difficult.

The carbon content of the catalyst deposit formed during an entire run was determined by titration of the standard potassium hydroxide solution in the wash bottles through which the regeneration gases were passed. The progress of regeneration could be followed by the temperatures in the catalyst bed. Complete regeneration was indicated when the lower thermocouples passed through a maximum temperature. The air rate was held constant at a value which ensured that this maximum temperature was less than 1100° F.

Data

A series of runs was made to investigate the effect of gage pressures ranging from zero to 450 psi at a temperature of 932° F and a liquid hourly space velocity of 1.0 volume of liquid feed at 60° F per volume of catalyst bed per hour. In each run the effect of catalyst fouling and the length of the process period was investigated by taking successive samples during runs of durations up to ten hours.

In another series of runs the effect of space velocities varying from 0.45 to 1.95 were investigated at a gage pressure of 450 psi and a temperature of 932° F. The effect of temperature was determined by a series of runs at temperatures ranging from 788° F to 1022° F while space velocity was constant at 1.0 and pressure at 450 psi. The data, grouped in these three series, are presented graphically in Figs. 4, 5, and 6 in which the toluene content of the product is plotted on a logarithmic scale against the length of the process period in minutes.

In Figs. 4 through 6 the solid lines represent the differential or instantaneous conversions which correspond to the indicated experimental points. The broken-line curves show integral or average conversions from the start of the process period to the indicated time. It will be noted that the agreement between different runs at duplicate operating conditions is not particularly good and the lines on the figures represent the estimated best average curves.

The runs at atmospheric pressure produced very little toluene

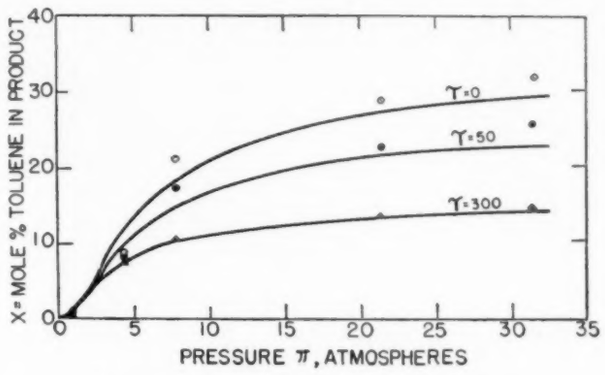


Fig. 7—Effect of Pressure on Conversion ($t = 932°$ F; $S_1 = 1.0$)

which could be detected by the analytical methods employed. However, there might have been as much as 2% present even when the analysis shows none. It will be noted from Fig. 4 that at higher pressures the conversion to toluene becomes substantial. Both conversion and rate of catalyst fouling are increased by increased pressure. These effects are also shown in Fig. 7, in which the data from Fig. 4 are cross plotted at period lengths of 0, 50, and 300 min. to give curves relating average conversion to pressure. The points on this chart are

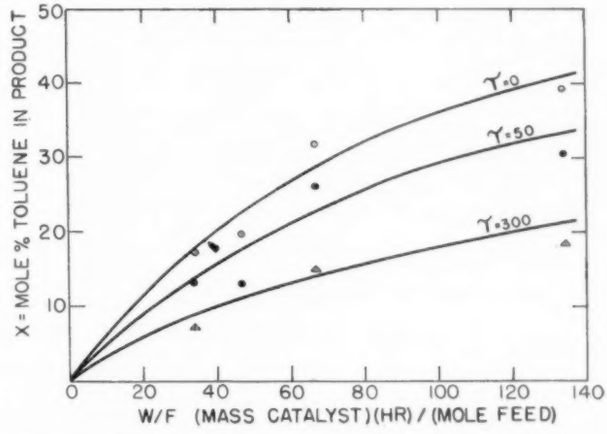


Fig. 8—Effect of Catalyst/Feed Rate Ratio on Conversion ($t = 932°$ F; $\pi = 31.5$ atms.)

taken from Fig. 3, while the curves are calculated from the kinetic equation discussed later.

In Fig. 8 the effect of feed rate or space velocity on conversion is shown by a cross-plot of Fig. 5, in which conversion is plotted against the catalyst/feed-rate ratio in (gram) (hr)/(g-mole). This abscissa scale is proportional to reciprocal space velocity. Although the data are scattered it is evident that conversion is progressively increased as catalyst/feed-rate ratio is increased and space velocity is reduced. Catalyst fouling

TABLE 1—Summary of Carbon Deposition Data

Run No.	Temp. °C	Pressure lb	S.V.	Length Min. of Run	Total Grams Carbon	Total Grams Toluene	gm C / gm T
52	420	450	1.0	491	8.8	56.5	.156
38	460	450	1.0	511	4.1	126.7	.032
39°	500	450	1.0	418	9.7	105.1	.092
43	500	450	1.0	410	6.7	98.1	.068
44	500	100	1.0	443	7.9	78.2	.101
51	500	50	1.0	459	10.1	61.1	.165
46	500	Atm.	1.0	350	0.6	...	...
47	500	Atm.	1.0	389	0.5	...	...
45	500	450	1.95	334	0.9	40.6	.022
50	500	450	0.50	672	10.5	150.4	.070
49°	550	450	1.0	260	14	45.3	.390

° The general rate curve for these conditions was used to obtain these total toluene values.

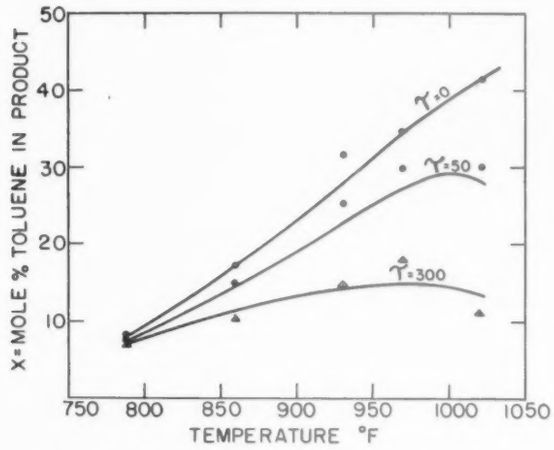


Fig. 9—Effect of Temperature on Conversion ($S_l = 1.0$; $\pi = 31.5$ atms.)

appears to be little affected by changes in space velocity and the resultant changes in conversion.

From Fig. 6 and its cross-plot in Fig. 9, it is evident that over the range investigated both conversion and the rate of fouling of the catalyst tend to increase with increased temperature. Although extrapolation to short process period lengths is somewhat uncertain, it is indicated that for very short periods of operation conversion would progressively increase with temperature over the entire range. However, in operations at longer process periods the fouling of the catalyst becomes so rapid at high temperatures that the conversion is reduced by increased temperature. This effect is shown by the maxima in the curves of Fig. 9 for the longer process periods.

The carbon data obtained by analysis of the regeneration gases are summarized for comparison to the operating conditions and toluene production in Table 1. Since these data represent the total carbon of the catalyst deposit for runs of varying lengths their interpretation is difficult. The results are erratic but there appears to be a tendency for the carbon deposited per gram of toluene formed to increase with increased temperature and reduced pressure. An average figure for the carbon content of the catalyst deposit appears to be of the order of 10% by weight of the toluene produced. This high formation of catalyst deposit would seriously impair the commercial production of toluene by the process both because of the short process periods required to maintain catalyst activity and the low ultimate yield of toluene. Distillation data on the small product samples were not sufficiently complete to permit estimation of ultimate yields, but the carbon data indicate that of the order of 70-80% of the theoretical yields might be expected.

(EDITOR'S NOTE: The balance of this article "Toluene from Benzene Plus Xylenes" will be further developed in the second section, to be published in the next issue.)

Acknowledgments

This work was carried out as a part of a project under the sponsorship of the Office of Production Research and Development of the War Production Board. The helpful suggestions of D. B. Keyes, L. A. Monroe, and W. L. Faith of this organization are gratefully acknowledged. Additional financial support was furnished by the Wisconsin Alumni Research Foundation. The catalyst used was made available through the cooperation of the Catalytic Development Co.

References

1. Dodd, R. H. and Watson, K. M., *Trans. Am. Inst. Chem. Eng.*, (1946) and NATIONAL PETROLEUM NEWS, *Technical Section*, 38, R-545 (July 3, 1946).
2. Gamson, B. W. and Watson, K. M., NATIONAL PETROLEUM NEWS, *Technical Section*, 36, R-623 (Sept. 6, 1944). Also "Process Engineering Data", National Petroleum Publishing Co., Cleveland (1944).
3. Hansford, R. C., Myers, C. G. and Sachanen, A. N., *Ind. Eng. Chem.*, 37, 671 (1945).
4. Hougen, O. A. and Watson, K. M., *Ind. Eng. Chem.*, 35, 529 (1943).
5. Pitzer, K. S. and Scott, D. W., *J. Am. Ch. Soc.*, 65, 803 (1943).
6. Reiser, C. O. and Watson, K. M., NATIONAL PETROLEUM NEWS, *Technical Section*, 38, R-260 (April 3, 1946).

NEW BOOKS FOR THE REFINER

Modern Plastics Encyclopedia Presents Fast-Changing Picture

Modern Plastics Encyclopedia, 1946, 8¼ x 11⅝ in., 1389 pages, stiff fabricoid binding, illustrated, 10 wall charts, indexed, $5.00.

The Plastics Industry, like the Petroleum Industry, has always presented a fast-changing picture of materials, methods, and uses. Today more plastic materials and markets are being developed than ever before. Anyone interested in the plastics field who wants to keep up with the pace needs the *Modern Plastics Encyclopedia*. Both laymen and technicians will find a wealth of useful information, well organized and attractively presented in this book. It takes the story of plastics from the base raw materials on through to the consumer in logical sequence.

Oil men will be especially interested in the many references to petroleum and the important role it is assuming as a raw material for plastics and plasticizers. For instance, in the flow charts of materials manufacture, of the 26 basic plastic materials illustrated, 12 use petroleum or petroleum gases as a basic raw material. In many of the other 14 basic types petroleum enters the picture as a source of plasticizers and solvents. In the 150 pages devoted to materials appears the complete story on each plastic—Recent developments, history, chemistry, manufacture, processing, properties and general characteristics, applications, forms available, outstanding properties, references to literature, and trade names. The book also contains a directory of companies in the plastics business.

5th Edition of N.G.S.M.A. Manual Now Available

Technical Manual for the Natural Gasoline and Cycling Industries, Fifth Edition, a Natural Gasoline Supply Men's Assn. publication, 8½ x 11, 135 pages including index, stiff cloth binding. NOTE: Available without charge only from N.G.S.M.A. members, upon request. NATIONAL PETROLEUM NEWS has a few extra copies which it will supply without cost on request as long as the supply lasts.

The latest edition of the *Technical Manual for the Natural Gasoline and Cycling Industries*, published by the Natural Gasoline Supply Men's Assn., is just off the press. To many technical men, there is little need of describing it, for the technical information it contains has in the past exhausted every printing within a short time. The last previous edition (4th) was printed in 1941 and, despite demand, was not reprinted. It was desired to include up-to-date information difficult to secure during wartime.

The present manual is a helpful and convenient compendium of information for office, plant and field engineers. It is impossible to list here all the data it contains. A glance at the index reveals charts of absorption factors; basic orifice factors, pipe and flange taps; boiler feedwater data; for butane; N. G. A. A. specifications, Mollier diagram, physical and thermodynamic properties, refrigeration chart and vaporization equilibrium constants; data on condensers and condenser tubes; brake horsepower charts for compressors; critical temperature and equivalent density chart as a function of molecular weight; hydrocarbon fluid densities; pitot tube tables, various alignment charts for gas flow through pipes; chart for determining friction and heat transfer —fluid flow in pipes; data for calculating pressure-temperature-volume relationships of pure gases and mixtures; vaporization

Copies of all books reviewed on this page can be ordered from the Book Department of *National Petroleum News*, 1213 West Third St., Cleveland, 13, for the prices listed, postpaid. Ohio purchasers please add 3% tax.

How much is waste costing in YOUR plant?

Here's how you can reduce it with BECKMAN pH CONTROL

IN industry after industry Beckman pH Control is reducing costs, minimizing waste, saving time and greatly increasing production efficiencies. Have *you* investigated what this amazing new profit tool can do in your plant? *Wherever there's water, there's pH.* So if you use water or water solutions of *any* kind . . . whether in pulps, liquids, or semi-solids—in process solutions, waste disposal or any other way . . . chances are that Beckman pH Control can help you do the job better—*for less.* Here, for example, is how others are slicing costs with Beckman equipment . . .

BECKMAN IS THE ONLY HIGH TEMPERATURE—HIGH pH EQUIPMENT

★ An important point to remember when installing pH control in your plant is that there is only ONE make of modern glass electrode pH equipment which can be used *continuously* in high temperature solutions. Even in boiling hot solutions, *Beckman High Temperature Glass Electrodes* give uniform accuracy and long life. This advancement is particularly useful in many food processes . . . in boiler feedwater conditioning . . . and in a wide range of chemical processing operations.

★ Beckman is also the *only* modern glass electrode equipment with which you can make high pH measurements *even in the presence of sodium ions* . . . a development that has extended the usefulness and accuracy of the glass electrode to many new industries where alkaline solutions, in combination with sodium ions, heretofore presented difficulties. A few of the many fields in which this Beckman development has proved indispensable include soap making, the manufacture of bleaches, detergents, etc.

SAVING CHEMICALS: By Beckman-controlling processes where chemicals are used, operations can be controlled so closely that overdosage and excess use of chemicals can be practically eliminated. Not only does this cut chemical costs, but it also assures more uniform processing, more accurate production control and greater plant efficiency.

REDUCING CORROSION: More and more plants are discovering the many advantages of reducing corrosion with Beckman pH Control. By Beckman controlling-process operations, these operators are able to regulate acidity and alkalinity—and thus neutralize excessively corrosive solutions before they damage costly plant equipment.

MINIMIZING REJECTS: Beckman pH Control is also making important savings by assuring more uniform quality of production. In many operations only a small change in pH makes a great difference in operation of the processing solutions. By Beckman-controlling the solutions, run after run is processed with identical quality, thus reducing rejects, cutting production costs and making greater savings in over-all efficiency.

SAVING TIME: Just as heat can frequently speed up chemical processes, so proper pH control can often save on processing time. Here again, even a relatively small saving on each production run quickly builds up to tremendous over-all savings in labor and plant overhead.

Let our engineering staff study *your* particular pH problem and make recommendations on the type of equipment best suited to your requirements. No obligation, of course.

For helpful information on pH control, send for this free booklet "What Every Executive Should Know About pH!"

BECKMAN

BECKMAN INSTRUMENTS • NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA 13, CALIFORNIA

INSTRUMENTS CONTROL MODERN INDUSTRIES

COMPLETE OIL PRICE STATISTICS

Available Now!—1945 Edition

PLATT'S OIL PRICE HANDBOOK

A complete day-by-day record of oil prices for the entire year 1945 in one handy, compact volume . . . Makes it easy for you to check the price for a particular product for any day during that year.

Comprehensive statistics and charts show production by states; stocks held and refinery output by districts, of the various petroleum products during 1945.

A Refinery Directory listing U. S. and Canadian refineries, with pertinent information concerning each refining company and refining plant; also Pipeline and Water Terminals.

Containing more detailed and helpful data on—individual refineries—refined product specifications—price quotations on more products—in more areas—than any of our previous editions, this valuable reference book—the only one of its kind—should be on hand for ready use in every oil office.

Important Features in this Latest Edition

- ★ Refinery and Seaboard prices on Refined Oil Products
- ★ Monthly and yearly averages of the highs and lows of price ranges—separately and combined
- ★ Tank Wagon and Dealer prices of Gasoline and Kerosine
- ★ Aviation Gasoline, Naphtha and Fuel Oil Tank Wagon Prices
- ★ Crude oil prices from all fields
- ★ Statistics and graphs on production and stocks of crude oil and principal refined products
- ★ U. S. Government, Army and Navy, ASTM and WPRA Specifications for refined products
- ★ Refinery Directory (Greatly enlarged)
- ★ New features: PAW I Adjustment Tables—Refining Plant Data—Terminals Data
- ★ A day-by-day price history of all petroleum products for 1945
- ★ 336 pages of valuable oil price information, indexed for ready reference.

Durably bound in dark brown buckram—Size 6¼ x 9—Price $12.50

Order Your Copies Today . . . . . Use the coupon below, or your regular company order form . . . Immediate delivery.

IF YOU ARE A . .

Buyer
Seller
Executive
Statistician
Research Analyst
Price Clerk
Librarian
Marketer
Broker
Technical Adviser
Refinery Sales Manager

. . . . YOU NEED PLATT'S OIL PRICE HANDBOOK

R-8746

Platt's Price Service Inc.,
1213 W. 3rd St., Cleveland 13, Ohio.

Please send me ..... copies of the 1945 Edition of Platt's Oil Price Handbook. Check in the amount of $..... is enclosed.

(Ohio purchasers, please add 3% sales tax)

NAME.....

COMPANY.....

ADDRESS.....

CITY-STATE.....

R-636

equilibrium constants for methane, ethane, propane, the butanes, pentanes, n-hexane, n-heptane and vapor pressure charts for these hydrocarbons.

For every edition of this manual, N. G. S. M. A. members have contributed liberally of their own data, as well as gathering from every possible source all commonly-required technical data pertaining to the industry. This has been sifted by the membership, with the advice of N. G. A. A.-member technologists. The result is a very worthwhile collection of technical information from authorities of high repute.

Seventh Edition of English Standard Test Methods

Standard Methods for Testing Petroleum and Its Products (Seventh Edition, 1946). Published by the Institute of Petroleum, 26, Portland Place, London, W.I., England. 550 pages, 149 diagrams. $3.25 in the U. S.

This latest edition includes new methods of procedure for estimating the percentage of sulphur present as carbon disulphide in petroleum, and for determining if coagulation of bitumen occurs on exposure of bituminous emulsion to low temperatures.

In addition to the new methods, the procedure for determining knock rating of aviation fuel, although essentially unaltered in principle, has been completely re-written to bring it editorially more into line with the corresponding A.S.T.M. method.

An innovation this year is the inclusion of a list showing new methods and methods and specifications which have been revised. The revised methods are listed in numerical order and details of the alterations to the methods are given.

The report of the Standardization Committee is now in the main confined to a discussion of work which has been proceeding during the year, but which has not reached the stage where new methods or amendments to existing methods can be put forward.

Handbook of Arc Welding Covers 16 New Subjects

Procedure Handbook of Arc Welding Design and Practice, 8th edition, 1312 pages, 6 x 9 in.; illustrated, semi-flexible cloth binding, $1.50 in U. S., $2.00 outside U. S.

The eighth edition of the Lincoln Electric Co.'s *Procedure Handbook of Arc Welding Design and Practice* is entirely revised to include the latest data on new arc welding methods and equipment. Although the new edition was issued late last year and is only now being reviewed in this column, it is still a valuable reference for refinery design and maintenance engineers.

The book includes details of the most recent welding methods and techniques, and incorporates a wealth of new information that obsoletes much of the previous literature on welding.

Cut Corrosion Costs!

Your Profit Margin Can Be Widened If Corrosion Is Prevented

By F. A. Rohrman
Associate Professor Dept. of Chem. Engineering, Kansas State College

Factors Contributing to Cost of Corrosion in Refineries

1—Costs of equipment or plant replacement.
2—Loss of time or production schedules by shut-downs.
3—Cost of inspections and maintenance.
4—Cost of protective means other than for maintenance.
5—Loss of product or conveyed material.
6—Cost of additional power to maintain flow of gas, fluid or heating medium.
7—Damages and suits owing to ruptures.
8—Loss of artistic value or eye appeal.
9—Cost of research on subject of corrosion.

THERE have been many references to the costs of corrosion in the refinery and to the oil industry in general, but to understand thoroughly what is involved it seems only reasonable to discuss the various factors that contribute to this cost. These factors may be tabulated as shown in table above.

With profit margins hovering near that thin red line, it is essential for the sake of the stockholders and one's job that all these factors be thoroughly studied and understood. Here is where the certified public accountant and the engineer must collaborate and check notes in order to evaluate the many economic vagaries involved in corrosion problems.

In the past it has been customary to evaluate the losses due to corrosion in terms of metal equipment lost. Corrosion has properly been charged with more monetary damage than fire and flood together. It has been estimated that as high as 40% of all the iron and steel made is for the purposes of replacements occasioned by corrosion. When such a percentage is translated into dollars it means expenditures of many millions. Such figures are indeed large even in these times.

When the equipment fabricated from iron or steel is replaced due to corrosion the costs are intensified. One could cite any number of illustrations in almost any phase of oil refining where corrosion has necessitated replacement of expensive equipment in relatively short periods of time.

Operating Costs Continue

A shut-down or slow-down caused by equipment destruction or replacement is in many respects just as severe to management and the general public as is a shut-down or slow-down by strikes. In the former, wages carry on and the public is rarely tolerant and understanding about plant inefficiencies. In the past four years particularly, plants were not supposed to slow down because of the "accidents" of corrosion. In these years a slow-down or shut-down from this cause was also in danger of being prolonged because of the difficulties in forcing the many barriers of priorities and shortages necessary to secure equipment replacements.

With labor costs closing up the profit margins, the factors of maintenance, re-installation, and inspection become more important than previously estimated. The traditional methods of painting in themselves require considerable labor. Recent estimates indicate that labor's share of maintenance costs is around 75%. This figure may soon be exceeded if better means of avoiding corrosion are not developed.

Routine Maintenance Not Enough

There are many means of reducing corrosion other than by routine maintenance. These are by water treatment, corrosion resistant alloys, phosphatizing, counter-electrolytic methods, application of plastics, etc. While such methods reduce the ravages of corrosion, with considerable savings, they do not come free and they also require maintenance.

It is almost impossible to estimate the cost in dollars incurred by the loss of products through leaks caused by corrosion. The average pipeline superintendent rarely knows of these losses until the leaks themselves are acutely manifest or until a material balance shows a definite leakage. When one considers the many millions of miles of water, gas, oil, and other pipe lines of different sizes in operation it is not inconceivable that a definite percentage of these lines are losing products at various rates of the materials transported at this very moment.

Power and heat and the conveyance of these forms of energy cost money. All lines, be they four feet, four inches, or one-fourth inch in diameter become corroded over a period of time and acquire layers of corrosion products, or become pitted, both of which conditions resist the flow of fluid, gas, or heat. It is well-known that many iron pipes may last 50 or 100 years without rupture; but it is not so well known that the flow of fluid, gas or heat through these same lines become retarded the day after installation. This varies considerably with different lines but it is evident enough.

Such pipe may not show any rupture but will show a high percentage depreciation in carrying power in a few years. The flow of heat through pipes and tubes is a function of the overall coefficient and this coefficient in turn is largely dependent upon the film coefficients. The moment a smooth, clean pipe becomes tarnished, corroded, or covered with products of corrosion, these film coefficients react to resist the flow of heat. It is not unusual for the over-all coefficient to be lowered 50% over a short period of time in some installations. This country has always had an abundance of economical power and the loss of a few million BTU's here and there certainly has not disturbed our national complacency. Is it smart to disregard these power losses due to corrosion? Some rapid calculations should convince you that these losses also run into large sums of money.

Good Will Important

The costs of damages incurred by leakage as a result of corrosion perforation certainly is no new problem to refiners. In a milder vein one may mention the loss of good will as a result of such unfortunate leaks. To attribute definite dollar charges to the consequences of leakage or escape of petroleum vapors and liquids is difficult, but they serve as potential threats for expensive lawsuits and the loss of valuable good will.

The question of plant appearance and artistic value or eye appeal offhand seems to bear small import in a discussion of this type but actually the need of having a well dressed exterior free from the marks of corrosion goes a long way in improving public relations as well as cutting repair costs. A well painted plant always improves appearances and is the first barrier against corrosion. The workmen in a clean plant will always take greater care and pride in the equipment—this is simple psychology.

The public is always more purchase conscious when an establishment shows a spic-and-span surface. The pride of a community in its refinery adds considerably to the good will value of the establishment.

Resume of a paper entitled "Economic Aspects of Refinery Corrosion Problems", presented before the meeting of the Wichita, Kans., section of the American Chemical Society, Wichita, June 6-7, 1946.

PERSONALS

Petroleum Technologists in the Headlines

Joe Y. Allen, Jr. has joined Clark Bros. Inc., as engineer in the Technical Service department of Clark's Houston office.

Mr. Allen is a graduate engineer of the University of Oklahoma, Class of 1940. During the World War, he served as Lt. Commander in the U.S.N. seeing action in the Mediterranean and European areas. Prior to entering the service, he was employed as an engineer by Gulf Oil Corp. In production department.

Mr. Allen Jr.

° ° °

The Standard Oil Co. of Indiana announces, effective July 1, 1946 the appointment of three new assistant directors of research. They are, **J. E. Seebold** who will be in charge of process design and exploratory economics, **Nathan Fragen** who will be assistant director in charge of pilot plant development and **B. H. Shoemaker** in charge of laboratory research on production of chemicals from petroleum.

° ° °

Paul C. Shea, Billings, Mont., has been elected vice-president in charge of refining and a director for Carter Oil Co. and will make his home at Tulsa. Mr. Shea will complete 20 years with Jersey Standard interests Aug. 9. He began his oil career as a helper in the Everett, Mass. refinery of Colonial Beacon Oil Co. in 1926, after graduating from Northeastern University, Boston, and taking special work at Massachusetts Institute of Technology. He became technical assistant to the vice-president, then general manager of the refinery and was a vice-president of Colonial Beacon when he was named acting manager of manufacturing for Carter's northwest division in August, 1945.

° ° °

Charles Haas has been appointed foreman in charge of the grease plant of Baltimore refinery of Standard Oil Co. of New Jersey.

° ° °

C. J. Gardner, assistant superintendent of Sinclair Refining Co.'s plant at Coffeyville, Kans., has been made superintendent of the plant with the retirement of **B. J. Healy.** Gardner has been with Sinclair nearly 28 years, working most of that time at the East Chicago, Ind., plant. Healy had been head of the Coffeyville plant 23 years prior to his retirement.

J. J. Connelly, former at the East Chicago plant, was named assistant superintendent at Coffeyville.

° ° °

William C. Ziegenfus has been made full-time recreational director at the Marcus Hook, Pa., refinery of Sun Oil Co. Ziegenfus formerly was athletic director of Swarthmore, Pa., High School.

° ° °

Bill Dulaney has been made general maintenance foreman of Pure Oil Co.'s Cabin Creek, W. Va., refinery. Other changes there include **Harold Sanders,** to general operating foreman; **Howard Pyle,** to technical foreman, and **Charlie Hulbert** to assistant resident chemist.

° ° °

Robert E. Wilson, chairman of the board of the Standard Oil Co. (Ind.), has been elected to life membership in the corporation of the Massachusetts Institute of Technology.

° ° °

M. C. Simmons has left the Bureau of Mines Experiment Station in Bartlesville, Okla., to become senior research chemist in the Houston Refinery Research Laboratory of Shell Oil Co.

° ° °

J. A. Richardson, formerly of Phillips Petroleum Co., is now chief process engineer for the natural gasoline department, Bechtel Bros. McCone Co., Los Angeles, Calif.

° ° °

Elbert L. Hatlelid, recently of the Monsanto Chemical Co., has joined Skelly Oil Co. research laboratories in Pawhuska, Okla., as chief chemist.

° ° °

G. E. Gude, Jr., for the past 10 years manager of sales for Wyatt Metal & Boiler Works, Houston, has been elected a director and made vice president of the company. He will continue as sales manager.

° ° °

R. J. S. Pigott, chief engineer of Gulf Research and Development Co., Pittsburgh, has been awarded Columbia University's Medal for Excellence. He has been a member of Tau Beta Pi (honorary engineering fraternity) at Columbia since 1903, was elected to Sigma Xi (honorary scientific fraternity) there in 1939 and to Sigma Tau (honorary engineering fraternity) at Pittsburgh in 1939.

Mr. Pigott is very active in the Society of Automotive Engineers, now serving as a Councillor and as a member of the Fuels and Lubricants Activities Committee. He is also on the CRC Co-ordinating Fuel Research Committee and CRC Co-ordinating Lubricants Research Committee, being chairman of the latter's division on engine oil.

James E. Hughes has been appointed chief engineer of Western Supply Co., Tulsa, and will also be in charge of Western's heat exchanger sales. He was formerly in the Chemical Products Department of Phillips Petroleum Co. Except for two years spent as Chief of the Pressure Vessel Section of PAW, in Washington, Mr. Hughes has been with the Phillips company since 1936 in various engineering capacities.

° ° °

Professor James O. Ball has been named head of the new department of petroleum refining engineering of the Colorado School of Mines, Golden, in a reorganization of the former department of petroleum engineering. **Professor Clark F. Barb** will head the department of petroleum production engineering.

Before coming to the School of Mines in 1938, Professor Ball was for 18 years refinery field and design engineer for Standard Oil Co. of Indiana. During the war he worked in cooperation with the U. S. Engineers Corps and Chemical Warfare Service at the Rocky Mountain Arsenal.

° ° °

Mr. E. F. Liebrecht of the M. W. Kellogg Co., New York, has been elected a vice president. He will handle all licensing for the company and have complete administrative direction of patent activities.

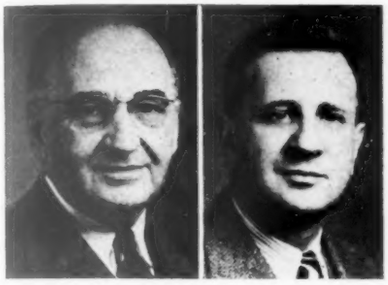
Mr. Liebrecht

The company's general patent attorney since 1940, Mr. Liebrecht studied law at St. Lawrence University and received his engineering degree from the Virginia Polytechnic Institute. Prior to joining Kellogg Co. he represented oil companies at the Washington Patent Office.

° ° °

After three and a half years of active service, **Major Stanley Asp,** U. S. Engineers Corps, has returned to his former duties with the research division of Filtrol Corp., Los Angeles. He first joined the technical staff of Filtrol in 1928.

Major Asp's early service was in the supply section of the initial Pacific operations. Later, in England, he aided in outfitting the 1st and 3d Armies for the invasion of Normandy, and in planning the allocation of supplies for the Continent. He was subsequently called upon for court martial duties in Paris.



Mr. Roberts Mr. Dale

H. D. Dale has been named general manager of the Wood River Refinery, succeeding **R. C. Roberts** who retired on March 31, 1946. In 1924 Mr. Dale started as a gager with Wood River and nine years later became head stillman. The following year, 1934, he was named assistant superintendent in charge of topping and cracking. After his appointment as refinery superintendent in 1941 Mr. Dale became head office manager of the manufacturing-operations department in 1944. Late in 1945 he became assistant to the vice president in charge of manufacturing.

° ° °

Socony-Vacuum's new general superintendent of the East St. Louis (Ill.) refinery is **Charles P. Baker.** He left Magnolia's Beaumont, Texas, refinery in 1942 to become a second lieutenant in the Infantry. Later he was assigned to PAW. He was chief of PAW's aviation section, refining division, with the rank of Major when he completed his assignment in Nov. 1945. He went to East St. Louis in Jan. 1946 as assistant to Socony-Vacuum's plant manager **W. H. Montgomery.**

° ° °

Norman B. Tichenor has been elected president of Petro Industries Inc., Minneapolis, Minn., which is engaged in the manufacture and compounding of lubricating oils. He was formerly Chicago representative of Stanco Distributors Inc.

° ° °

George L. Neely has returned to his former position as lubricant manager for Standard Oil Company of California, San Francisco. Mr. Neely had previously done technical work for Standard, notably in fuel and lubricant research. He played a leading role in the development of Standard's diesel engine lubricating oil and was identified with the development of aviation gasoline. As a Commander in the Navy he served as a "trouble shooter" on engineering problems in the Pacific.

° ° °

Appointment of **D. K. Harger** as manager of all refining divisions at the El Segundo refinery has been announced by Standard of California.

Mr. Harger joined Standard in 1926 and has spent 13 of his 20 years with the company at El Segundo refinery. His latest position was superintendent of the light oil division at the company's Richmond refinery. His home is in Riverside, California.

° ° °

Dr. Willard H. Dow, president and chairman of the Dow Chemical Company of Midland Mich., has been awarded the Chemical Industry Medal for 1946.

Sidney D. Kirkpatrick, chairman of the American Section of the Society of Chemical Industry, made the announcement, and cited Dr. Dow for his "conspicuous service to applied chemistry."

Dr. Dow is also president of the Ethyl-Dow Chemical Company which was the war time pioneer in sea-water chemistry and aided greatly in the production and research of synthetic rubber. Besides supervising the extensive war work of the company he served during the war on the Chemical Advisory Committee of the Army and Navy Munitions Board and on the Chemical Warfare Service Advisory Board.

The Chemical Industry Medal will be presented at a dinner in the Hotel Commodore in New York City on November 8, 1946. It is the third scientific award won by Dr. Dow since 1934.

ADVERTISERS' INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate but National Petroleum News assumes no responsibility for errors or omissions.

Alcorn Combustion Co. R-590
Aluminum Ore Co. R-611
American Cyanamid & Chemical Corp. R-609
Anderson Co., V. D. R-604

Baker & Adamson Div. of General Chemical Co. ..... Inside Back Cover
Badger & Sons Co., E. B. R-600, R-601

Chicago Bridge & Iron Co. R-614
Clark Bros. Co., Inc. R-623
Cooper-Bessemer Corp. R-617

Dowell, Inc. R-585
DuPont de Nemours & Co. Inc., E. I. R-581

Emery Industries Inc. R-625
Ethyl Corp. R-562

Foxboro Co. R-591

General Chemical Co. ..... Inside Back Cover
Graver Tank & Mfg. Co., Inc. R-631

Hammond Iron Works R-619
Houdry Process Corp. R-605
Hudson Engineering Corp. Inside Front Cover

Lummus Co. ..... Facing R-592

McKee & Co., Arthur G. R-589
Metasap Chemical Co. R-627
Monsanto Chemical Co. R-607

National Petroleum News R-626, R-628, R-636, R-639
National Technical Laboratories R-634

Petro-Chem Development Co. R-573
Petroleum Engineering, Inc. R-582, R-583
Petroleum Rectifying Co. R-603
Powell Co., Wm. R-597

Remler Co., Ltd. R-615

Stanco Distributors, Inc. (Paramins) .. R-595

Universal Oil Products Co. R-575

Warren Petroleum Corp. R-621
Wyatt Metal & Boiler Works ..... Outside Back Cover

FREE REPRINTS
from
NPN Technical Section

Single copies of any or all of the following articles will be given free, on request, as long as supply lasts:

ANALYZE ADDITIVE LUBRICANTS IN MINUTES INSTEAD OF HOURS WITH SPECTROGRAPHIC METHOD—*(By Lyle E. Calkins and M. M. White)*—An explanation and discussion of a recently developed method for analyzing additive lubricants . . . The method described is faster than conventional chemical methods, but is claimed to be equally as accurate . . . Illustrated with tables, graphs and photos.

CHARTS SHOW VISCOSITY AND OXIDATION CHANGES IN USED CRANKCASE OILS—*(By C. M. Larson)*—Two charts, explained in detail . . . One covers dilution and oxidation changes in viscosity for gasoline engine lubricating oils during service; the other covers the same factors in Diesel engine service.

CONDENSATE FROM NATURAL GAS YIELDS MOTOR FUEL DIRECTLY—*(By George G. Brown)*—Explains the advantages of using "condensate" to secure finished motor fuels of satisfactory volatility instead of for blending. The motor fuels thus secured meet the new federal specifications and are competitive with other fuels.

KINETICS OF THE PROCESS OF THERMAL POLYMERIZATION OF BUTADIENE—*(By S. V. Lebedev, M. A. Khokhlovkin, N. I. Kuibina and others)*—A translation from the Russian by Dr. J. G. Tolpin, with illustrative charts and tables, describing the various reactions in the experiments.

USE OF CHEMICAL ADDITIVES IN PETROLEUM PRODUCTS—*(By L. A. Hamilton and P. V. Keyser, Jr.)*—An all-inclusive review and discussion of the important aspects in the development of addition agents for fuels and lubricants. Covers both patent literature and technical publications. Includes tables, charts and illustrations.

SYNTHESIS OF ACETONE FROM ACETYLENE—*(By A. S. Broun, O. S. Kuratova, D. V. Mushenko and R. P. Urinson)*—A translation from the Russian by Dr. J. G. Tolpin with illustrative charts and tables describing the various effects obtained in the experiment.

UNITIZED CYCLING OPERATIONS AT HAYNESVILLE INCREASE ULTIMATE RECOVERY 8 MILLION BBLS.—*(By B. R. Carney)*—Explains the organization and advantages of an operators' cooperative plan for pressure maintenance in oil field operations.

VAPOR PHASE OXIDIZING CRACKING OF OIL PRODUCTS—*(By L. I. Berents and V. E. Glushnev)*—As translated from the Russian by Dr. J. G. Tolpin. Discusses the effect of cracking hydrocarbons in the presence of air. Explanatory charts and tables of the experiments made are shown.

THE COMING PETROCHEMICAL INDUSTRY—*(By George E. P. Smith, Jr. and Henry F. Palmer)*—Deals with the fundamentals of manufacturing chemicals from petroleum bases . . . Also presents statistical data on the history and growth of the U. S. chemical industry.

Mail your request for the above free reprints to: Readers' Service Department, National Petroleum News, 1213 West Third Street, Cleveland 13, O.

WIDENING HORIZONS

Views on Personnel, Management and Economic as Well as Technological Developments in Petroleum Refining and Natural Gas Processing: Comment from Readers is Invited

Consolidate Oil Companies Attack On Refinery Corrosion Losses

ATTENTION has been focused anew on the importance of the metal corrosion problem to industry in this country, through announcements by two agencies of special programs of research and study in this field.

Massachusetts Institute of Technology is just now launching a new project which will coordinate its research and instruction on this subject. The resources of all its departments will be brought to bear to expedite the search for methods of preventing or controlling metals corrosion. Dr. Herbert H. Uhlig, an authority in this field, has joined the M.I.T. staff to take active charge of the project.

Dow Chemical Co. also has built a special laboratory and set up other special facilities to expand the metals and cathodic research program it started six years ago. Its new venture is described as the first of comparable scope to be undertaken by an American industry for the exclusive and comprehensive study of the whole problem of corrosion of metals. Both these institutions place the annual loss in this country from this cause at some billions of dollars.

In the petroleum industry alone, M.I.T. authorities have estimated, the losses from corrosion amount to approximately $125,000,000 annually in the refining field and $50,000,000 in the pipeline branch. These two figures emphasize the importance of work in checking and eliminating corrosion losses to all oil companies. While these figures on losses are impressive, they may not represent, however, the extent of damages the refining and pipeline companies today encounter from this "disease" of metals.

The loss figures used by M.I.T. go back to 1927 when a survey was made among the oil companies by the American Petroleum Institute to estimate the annual damages due to corrosion, including maintenance, loss of time when operating units were shut down and depreciation due to this cause. The refineries at that time were running 2,500,000 b/d of crude to stills, while today runs to stills are nearly 5,000,000 b/d. More corrosion resistant materials are used in refineries today and in general more is known of combatting corrosion. However, it is likely that the loss figure from this cause today to the refining industry is far greater than the $125,000,000 figure set up in 1927. The same is likely true for the $50,000,000 loss to pipelines.

The A.P.I., in its study of corrosion losses in 1927 made what was perhaps the first industry wide survey on this subject in this country. This was followed by the organization of special committees in 1928, one for refineries and tankers and barges, and one for the production industry, to develop a means for attack on the problem. The latter group has been more active in the years since and is still functioning as an active committee of the A.P.I. Production Division.

Under the direction of the committee on corrosion of the Refining Division, J. A. Jamison, of the technical staff of M. W. Kellogg Co., was secured by the A.P.I. in 1937 to make a year's study of the corrosion protection of refinery equipment. He presented a valuable report, based on some 50 plant case studies, at the 1938 A.P.I. annual meeting.

Since this 1938 survey was undertaken, additional new processes have come into general use in the refineries, among them catalytic cracking and alkylation. These and other new processes have greatly increased the use of chemicals, adding to present day corrosion problems in the plants. A greater volume of the corrosive high sulfur crudes is being processed than heretofore. On the other hand, a greater variety of materials is available for use in refinery equipment where corrosion may be experienced. Also many of the oil companies by now have accumulated considerable experience data on various types of equipment which helps reduce their plant damages.

Data of this nature collected by some central agency and made available to all refiners would be of great help to them individually in combatting corrosion losses. For illustration, Phillips Petroleum Co. has compiled its data on corrosion of materials used in hydrofluoric acid alkylation plants and made it available to the industry generally in book form (see pg. R-618). It would seem that the Refining Division of the A.P.I. could again undertake the task of collecting and disseminating the available company experience on corrosion prevention. There should be no reluctance on the part of the individual companies in passing on what they have learned. Pooling the industry's experience and knowledge would create a valuable weapon for all companies to use in their attack on the costly corrosion losses.

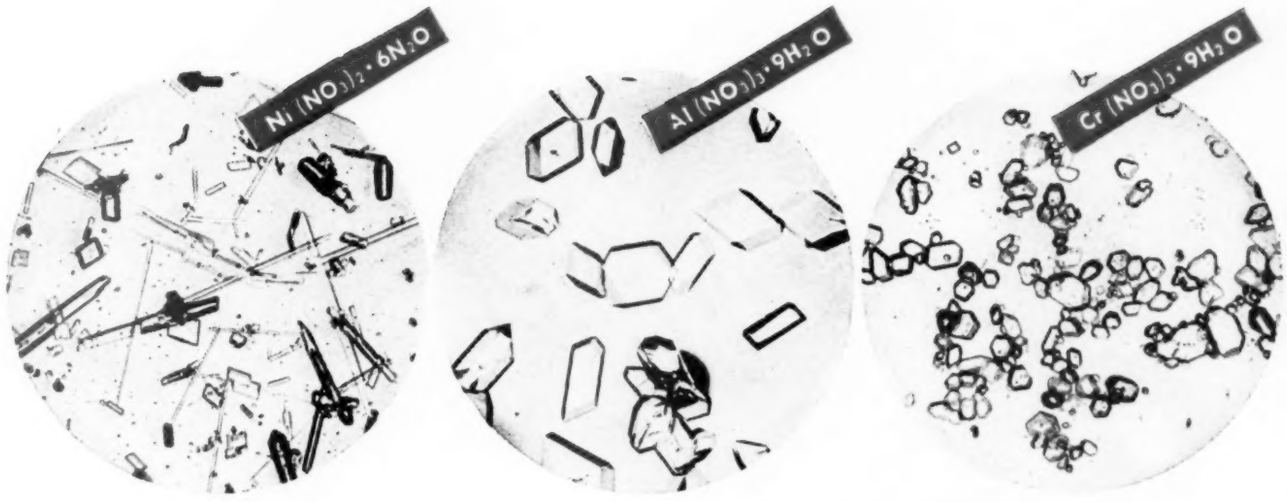
NPN's Technical Section Becomes PETROLEUM PROCESSING

THE Editor has the privilege of telling readers that the Sept. 4th issue of this magazine will carry the title PETROLEUM PROCESSING. General announcement to that effect will soon be forthcoming. Response from readers to the publishing of technical articles on petroleum refining in a special monthly Technical Section of National Petroleum News has warranted the decision of the publishers to make that Section a separate magazine.

The editorial policy followed the past four years in the NPN *Technical Section* will be continued and broadened in scope. The format and present features will be maintained. Through its own editorial staff of technical writers, new developments in the entire field of the processing of petroleum and natural gas will be reviewed and brought to readers promptly. Plant operating methods, practices and maintenance and the use of new equipment will be reported, as well as new technological developments in processes and research. These staff-written articles will be amplified by special articles by outside authorities, as additional data on important subjects becomes available.

The name PETROLEUM PROCESSING has been adopted as most fittingly defining the editorial scope of this expanded NPN *Technical Section*.

In this undertaking, the Editorial Staff can ask for nothing of greater help to them than that the warm interest and suggestions and criticisms which readers have given the NPN *Technical Section* be continued for PETROLEUM PROCESSING.



READILY AVAILABLE IN COMMERCIAL QUANTITIES

B & A Metallic Nitrates

(PURIFIED AND REAGENT GRADES)

From Aluminum to Zinc—whenever your production program calls for one of the Metallic Nitrates, make the Baker & Adamson Division of General Chemical Company your source of supply.

These B & A Fine Chemicals are available in tonnage or other commercial quantities with two grades of most to choose from: *Purified*, for general manufacturing use; *Reagent*, for more exacting requirements.

Into their production goes all of the skill and science Baker & Adamson has gained in 64 years of "setting the pace in chemical purity." That is why B&A Metallic Nitrates are products of highest quality in every grade. That is why you can be sure—and be satisfied—when you specify B&A Metallic Nitrates for your operations.

ALUMINUM
NICKELOUS
CHROMIUM
COBALTOUS
CADMIUM
CUPRIC
LEAD
Ferric
Magnesium
Calcium
Zinc
and others

REAGENTS
B&A
BAKER & ADAMSON
QUALITY
STANDARD OF PURITY
FINE CHEMICALS

GENERAL CHEMICAL COMPANY

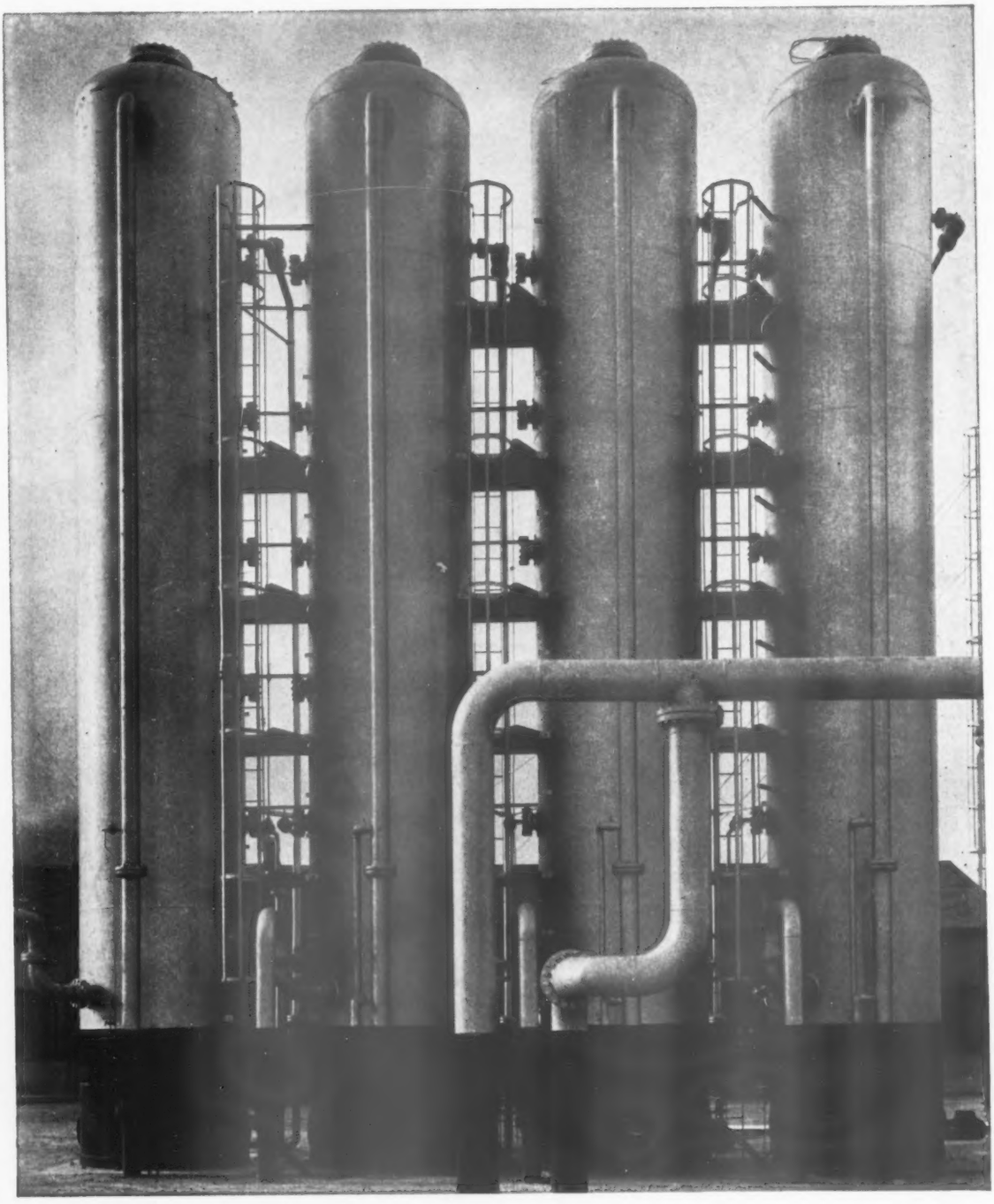
BAKER & ADAMSON DIVISION

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Birmingham* • Boston • Bridgeport • Buffalo* Charlotte* • Chicago* • Cleveland* • Denver • Detroit* • Houston • Kansas City • Los Angeles* Minneapolis • New York* • Philadelphia* • Pittsburgh* • Providence • St. Louis* • San Francisco* • Seattle Utica • Wenatchee (Wash.) • Yakima (Wash.)
In Wisconsin, General Chemical Wisconsin Corporation, Milwaukee, Wis.
In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver

SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

* Complete stocks carried here.



ABSORBERS FOR WEST TEXAS

•

Efficient and low-cost operation assured through proper design and precision fabrication from quality materials.

•

WYATT METAL & BOILER WORKS

Wyatt's

HOUSTON - DALLAS